

Trinity Broadcasting Network  
2442 Michelle Drive  
Tustin, CA 92780

LPN Spectrum LLC  
6200 Stoneridge Mall Rd, Suite 300  
Pleasanton, CA 94588

May 16, 2019

**VIA ELECTRONIC FILING**

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 Twelfth Street, SW  
Washington, D.C. 20554

Re: Notice of Ex Parte Communication, *Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band*, GN Docket No. 18-122

Dear Ms. Dortch:

Trinity Broadcasting Network (“TBN”) and LPN Spectrum LLC (“LPN”) jointly file these ex parte comments in the above-captioned proceeding in support of the Commission’s efforts to repurpose part of the C-band for 5G terrestrial use. The next generation of wireless technology promises to be a significant driver of economic growth and opportunity in a variety of industrial sectors and will change nearly every aspect of our daily lives. Repurposing part of the C-band for wireless broadband services while balancing the need to support incumbent operations is key to capturing the enormous value that 5G will bring to American businesses and consumers alike. This proceeding will help position the United States as the global leader in the race to 5G.

With initial aspirations to “serve[] the interests of all stakeholders” in the C-band, Intel and Intelsat began this proceeding on the right track.<sup>1</sup> That initial momentum has been slowed by disagreements among stakeholders, causing the proceeding to effectively stall. This is due to a basic failure of the C-Band Alliance (“CBA”) to recognize that other stakeholders have legitimate interests in what is really a “shared use” band and that any viable solution for repurposing part of the C-band must facilitate significant spectrum clearance. TBN and LPN propose that any final order adopted by the Commission related to this proceeding embrace five core principles (the “Five Principles”). Specifically, any C-band plan must:

1. Reflect the Significant Value Gap Between Current and Future Use of C-Band Spectrum: The economic and social value of C-band spectrum deployed for future 5G terrestrial use is significantly greater than that for existing satellite use;

---

<sup>1</sup> Joint Comments of Intelsat License LLC and Intel Corporation at 1, GN Docket No. 17-183 (filed Oct. 2, 2017).

2. Offer Substantial Incentives to Compensate Earth Station Operators and C-Band Users:<sup>2</sup>  
As Commissioner Rosenworcel explained in this proceeding, “[T]he price we pay when we cede leadership is a loss in early scale and a voice in standards development and device specifications that can yield innovation and jobs we want to see here, on our shores.”<sup>3</sup> Without meaningful incentives for earth station operators and C-band users, this proceeding will remain stalled and the U.S. will not achieve the optimal clearance target for new 5G spectrum;
3. Create a Voluntary Structure to Clear At Least 300 MHz: Alluding to the CBA plan, Commissioner Carr stated, “One proposal on the table involves clearing around 200 MHz of the 500 MHz total to be used for mobile. I think we can do better. So I am focused right now on approaches that will clear more than 200 MHz, at least in big cities where demand for high-capacity, mid-band spectrum is greatest.”<sup>4</sup> Commissioner O’Rielly has also “strongly advocated for at least 200 or 300 megahertz, with a serious review to release even more.”<sup>5</sup> In testimony at his confirmation hearing, Commissioner Starks said “[i]t is going to be essential that we continue to have more and more spectrum” made available, including in the C-band.<sup>6</sup> A clearance target of at least 300 MHz for repurposed C-band spectrum — coupled with opportunities for C-band users to voluntarily relinquish the use of all or a portion of their spectrum — will ensure that this spectrum is put to its best use, allowing the U.S. wireless industry to remain competitive while winning the 5G race;
4. Ensure Inclusive Treatment of All C-Band Stakeholders: As Chairman Pai recently observed, “there are a lot of interests in [the C-]band that need to be accommodated.”<sup>7</sup> An inclusive, market-based approach with a distribution and scoring model (“DSM”)

---

<sup>2</sup> C-band users — as distinct from earth station operators — are broadcasters, content providers, and other third-party providers that lease transponder capacity on C-band satellites.

<sup>3</sup> Statement of FCC Comm’r Jessica Rosenworcel at 1, *Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, FCC 18-91, GN Docket No. 18-122 (rel. July 13, 2018).

<sup>4</sup> Keynote Remarks of FCC Comm’r Brendan Carr at the WISPAmerica Convention: Grain Elevators, Water Towers, and Other Ways to Connect Americans at 4 (Mar. 20, 2019), available at <https://docs.fcc.gov/public/attachments/DOC-356655A1.pdf>.

<sup>5</sup> Statement of FCC Comm’r Michael O’Rielly at 1, *Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, FCC 18-91, GN Docket No. 18-122 (rel. July 13, 2018).

<sup>6</sup> Monica Allevan, *FCC Nominee Starks Says Spectrum, Deployment Key to 5G Leadership*, FierceWireless (June 21, 2018, 8:00 AM), <https://www.fiercewireless.com/wireless/fcc-nominee-starks-says-spectrum-deployment-key-to-5g-leadership-0>.

<sup>7</sup> Interview of FCC Chairman Ajit Pai at America’s Communications Association Summit at 17:55-18:00 (Mar. 21, 2019), available at <https://www.c-span.org/video/?458896-1/fcc-chair-ajit-pai-addresses-americas-communications-association-summit>)&start=955 (emphasis added).

similar to that proposed by the small satellite operators<sup>8</sup> will ensure increased participation of *all* C-band stakeholders (i.e., taxpayers, satellite operators, earth station operators and C-band users); and

5. Appoint an Independent and Effective Transition Facilitator: The two principal Commission precedents involving third-party oversight of a transition process provide difficult lessons that cannot be ignored.<sup>9</sup> The Commission must apply these lessons to ensure neutrality, fairness, transparency, efficiency, and accountability.

TBN is the largest and most widely watched religious broadcaster in the United States, serving more than 100 million homes across the country. It operates 57 C-band earth stations (transmit and receive) at its 35 broadcast television stations. TBN also delivers content to over 600 cable systems using more than 1000 C-band earth stations. In addition, TBN delivers content to 114 C-band earth stations for prison ministry. Thus, C-band spectrum is fundamental to TBN's delivery architecture. TBN wants to ensure that (a) enough spectrum is still available for incumbent use after any repurposing of C-band spectrum, (b) post-transition C-band capacity does not lead to price increases in the industry, and (c) C-band users and earth station operators are compensated and incented to participate in the repurposing process. While it brings the perspective of a C-band user, TBN shares a broader goal of building a consensus to achieve an efficient, timely and functional clearance of at least 300 MHz of C-band spectrum for 5G.

LPN offers the Commission a unique perspective on the C-band reallocation.<sup>10</sup> With its focus on investment value, LPN brings a broader vantage point that is not colored or constrained by the narrower interests of the various C-band licensees, operators and users. LPN has been closely monitoring this proceeding and has grown increasingly concerned as it has witnessed a

---

<sup>8</sup> See Reply Comments of ABS, Hispasat, and Embratel Star One at 21-26, GN Docket No. 18-122 (filed Dec. 11, 2018) ("SSO Reply Comments").

<sup>9</sup> See *Telcordia Technologies, Inc. Petition to Reform Amendment 57 and to Order a Competitive Bidding Process for Number Portability Administration*, Order, 30 FCC Rcd. 3082 (2015) ("LNPA Selection Order"); *Improving Public Safety Communications in the 800 MHz Band*, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order, 19 FCC Rcd. 14969 (2004) ("800 MHz Order").

<sup>10</sup> Currently, LPN is not a licensed operator or user of C-band spectrum. LPN was founded and is operated by the same founders and management team who operated LocusPoint Networks LLC ("LocusPoint Networks"). Working in partnership with one of the largest alternative asset managers in the world since 2012, LocusPoint Networks operated and invested in a variety of broadcast TV stations, most of which registered for participation in the broadcast incentive auction. As a founding member of the Expanding Opportunities for Broadcasters Coalition, LocusPoint Networks played a critical role in working with various bureaus and the Incentive Auction Task Force at the Commission and provided input that contributed to the development of flexible rules and widespread participation in the broadcast incentive auction. LocusPoint Networks has a long history as a business partner of TBN's and entered into a number of channel sharing deals with TBN during the broadcast incentive auction.

divergence of views among the various stakeholders, with no emerging consensus. By weighing in at this juncture, LPN seeks to play the role of problem solver and coalition builder.

TBN and LPN are in the process of creating a broad coalition of earth station operators and C-band users — most of whom have had a diffused voice due to the fragmented ownership structure of the C-band.<sup>11</sup> This new coalition will embrace the Five Principles outlined above with the objective of working with the Commission and all C-band stakeholders on getting the proceeding back on track.

Time is the enemy of the United States in the race to be the global leader of 5G. TBN and LPN urge the Commission to adopt an approach that adopts the Five Principles to achieve a viable path forward for all stakeholders and serve the public interest.

## **I. THE REALLOCATION OF THE C-BAND FOR WIRELESS BROADBAND USE WILL UNLOCK SIGNIFICANT VALUE**

The reallocation of the 3.7 to 4.2 GHz band for 5G terrestrial use will generate far more value than has been discussed to date in the record. This potential value arises largely from the relatively low utilization rate of C-band spectrum and associated transponders on the satellites. As noted in the enclosed Addendum, only about 21% of spectrum allocated (from a satellite-MHz perspective) for C-band authorizations in the United States is actually used.<sup>12</sup> This is due to two key reasons:

- There are currently 63 satellites authorized for C-band use that provide some coverage in the continental United States (“CONUS”).<sup>13</sup> However, only 23 (or about 37%) of them appear to provide service to earth stations in the CONUS.<sup>14</sup>
- The actual transponder utilization on these 23 satellites appears to be low. Each of these satellites typically has 24 transponders, which means that there are a total of 552 transponders on all of the U.S. revenue-generating satellites.<sup>15</sup> However, only 318 of these transponders appear to be user-occupied, which translates to a transponder utilization rate of approximately 58%.<sup>16</sup>

---

<sup>11</sup> See Letter from the Small Satellite Operators to Marlene H. Dortch, Secretary, FCC, Attachment at 12, GN Docket No. 18-122 (filed Dec. 18, 2018) (“SSO Ex Parte”) (noting that “[t]here are ~20,000 earth station antennas registered, which are owned by over 2,700 entities”).

<sup>12</sup> Addendum, Section A at 4.

<sup>13</sup> *Id.*

<sup>14</sup> *Id.*

<sup>15</sup> *Id.*, Section A at 4-5.

<sup>16</sup> *Id.*, Section A at 4.

These two factors yield a utilization of approximately 21% (37% x 58%) from an allocated satellite-MHz perspective. Given that nearly 42% of the transponders remain unused on the 23 U.S. revenue-generating satellites, there is enough space to “repack” C-band users within the band and clear 200 MHz (i.e., 40%) of the spectrum.

Separately, there is a significant differential in the business value of spectrum in the 3.7 to 4.2 GHz band for satellite use versus 5G terrestrial use. C-band operations in the United States currently generate around \$340 million in revenues on an annual basis.<sup>17</sup> Assuming a 71% EBITDA margin and an 8.25x EBITDA multiple, the current enterprise value for 500 MHz of C-band spectrum for satellite use equals around \$1.99 billion.<sup>18</sup> Assuming a U.S. population of 325 million, the implied value of this spectrum for satellite use translates to just *\$0.012/MHz-Pop*.<sup>19</sup>

In contrast, similar spectrum has been valued anywhere from between \$0.05 to \$0.42/MHz-Pop in other parts of the world.<sup>20</sup> Tellingly, the most recent comparable, from an auction in Italy, yielded a value of \$0.42/MHz-Pop,<sup>21</sup> most likely due to the gradual maturation of the ecosystem surrounding mid-band spectrum and the momentum around 5G deployments. While acknowledging the differences between the U.S. and Italy, it is not difficult to assess the vast value gap.

Finally, it must be noted that clearance and sale of *only 200 MHz* of C-band spectrum in the 3.7 to 4.2 GHz band (at \$0.40/MHz pop) for wireless broadband usage could yield revenues of about \$26 billion.<sup>22</sup> Given the low utilization of the current transponders, current C-band users in the lower 200 MHz can be repacked onto leftover transponders (i.e., in the leftover 300 MHz of the band) on the same or another satellite, allowing the satellite operators to continue to generate the revenue and EBITDA associated with those users.

The unmistakable conclusion from this analysis is that proceeds from the sale of C-band spectrum for 5G terrestrial use will likely far exceed the value associated with its current use in fixed satellite service (“FSS”). Once repurposed and deployed for 5G terrestrial use, this spectrum will lead to increased market opportunities for American businesses, a wider array of products and services available to American consumers, and a more rapid closure of the digital divide for those living in rural and other underserved communities across the country.<sup>23</sup> Thus,

---

<sup>17</sup> *Id.*, Section B at 9.

<sup>18</sup> *Id.*

<sup>19</sup> *Id.*

<sup>20</sup> *Id.*, Section B at 10.

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*, Section B at 11.

<sup>23</sup> See Letter from Comcast Corporation to Marlene H. Dortch, Secretary, FCC, Attachment at 2, 5, GN Docket No. 18-122 (filed Apr. 30, 2019) (“Comcast Ex Parte”).

the more C-band spectrum that is reallocated, the greater the benefits will be for industry and the public alike.

## **II. ANY COMMISSION EFFORTS TO CLEAR C-BAND SPECTRUM SHOULD INCLUDE EFFECTIVE INCENTIVES TO COMPENSATE EARTH STATION OPERATORS AND C-BAND USERS**

Notwithstanding the benefits, clearing C-band spectrum will not be a simple exercise. For one thing, the complicated and fairly opaque rights structure governing C-band spectrum poses a number of challenges to expanding flexible use of the band. All FSS licensees (satellite operators and earth station operators) have equal and nonexclusive rights to the entirety of the C-band.<sup>24</sup> The nonexclusive nature of C-band licensing creates a “reverse public goods problem,” where “each FSS licensee has an incentive to overstate its value of the spectrum in order to increase its payment.”<sup>25</sup> The fact that earth station operator interests are diffuse and shared among numerous licensees and registrants further complicates matters.

There are technical issues to consider as well. In order to free up 200 MHz, satellite operators will need to relocate C-band users (along with their associated earth stations) from the bottom 10 transponders on each of the revenue-generating C-band satellites to the top 14 transponders on the same satellite or another satellite. The level of effort involved will vary by C-band user and their associated earth stations, and some of the required tasks have been outlined in a recent CBA filing (the “Customer Commitment Ex Parte”).<sup>26</sup>

The Customer Commitment Ex Parte proposes that C-band users hand over critical data to the CBA.<sup>27</sup> It is important to note, however, that earth station operator data held by C-band users (e.g., broadcasters and network programmers) has substantial commercial and competitive value. A relocation process that requires C-band users to hand over this critical data to the CBA will be untenable. Further, satellite operators themselves do not have direct business relationships with the vast majority of earth station operators. Those business relationships are established and nurtured by C-band users, who will need to undertake significant coordination efforts with earth station operators — which could run in the hundreds, as is the case with TBN — in connection with the reallocation. Any solution that hopes to garner a consensus on the path forward with respect to the C-band reallocation must adequately account for these commercial

---

<sup>24</sup> *Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, FCC 18-91, GN Docket No. 18-122, at 22 (¶ 59) (rel. July 13, 2018) (“NPRM”).

<sup>25</sup> *Id.* at 22 (¶ 61).

<sup>26</sup> See Letter from the C-Band Alliance to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (Apr. 3, 2019) (“Customer Commitment Ex Parte”).

<sup>27</sup> See *id.*, Attachment at 11 (explaining that “[t]he CBA would . . . establish a database portal designed to collect additional necessary information from End Users to ensure that all antennas are adequately addressed in the repacking process”).

interests. The proposed compensation and project management framework outlined in the Customer Commitment Ex Parte not only is inadequate as a substantive matter but also grossly underestimates the level of effort involved in successfully completing the reallocation.

Any assumption that C-band users routinely go through transponder relocations of the sort that will be required by the C-band reallocation is misplaced. It is true that C-band users and their associated earth station operators do make modifications to transponders that are necessitated by operational and technical issues related to the satellites. But the proposed repurposing effort is different: in this instance, parties are being asked to shoulder significant financial and administrative burdens to clear a shared use band — something that they would not normally undertake in the ordinary course of business — and to do so to the exclusive benefit of CBA members.<sup>28</sup>

Recent efforts by the CBA to “protect” service quality and reliability for customers<sup>29</sup> demonstrate that CBA members intend to compensate earth station operators no more than \$94.8 million for their relocation costs.<sup>30</sup> This amount is dwarfed, however, by the roughly \$26 billion that is likely to be generated from the private sale of 200 MHz of spectrum in the 3.7 to 4.2 GHz band.<sup>31</sup> Under the CBA plan, none of this excess economic value would be realized by earth station operators or C-band users. As a result, the benefits of the reallocation would be inequitably distributed, which could lead to a discouragement of participation by other stakeholders, increased litigation risk, demands for Commission micromanagement, unnecessary delays in making repurposed spectrum available, and suboptimal outcomes in the transition more generally.

Repurposing any part of the C-band spectrum will require coordination among satellite operators, C-band users and earth station operators. The only way to ensure that the transition happens in a predictable and timely manner is to appropriately compensate and incentivize each and every stakeholder. It does not make sense for the Commission to adopt an order that results in a process where C-band users and earth station operators are simply “made whole” with respect to their relocation expenses while the satellite operators walk away with the excess economic value created. Nor will it make sense for satellite operators to just be “made whole.” In other words, any order adopted by the Commission must provide financial incentives to all stakeholders rather than simply cover their relocation costs.

---

<sup>28</sup> See Reply Comments of the American Cable Association at 9-10, GN Docket No. 18-122 (filed Dec. 11, 2018) (“ACA Reply Comments”) (criticizing the CBA plan because “coalition members will be reimbursed for their prior investment and opportunity costs,” while “FSS users . . . will be confined to their reconfiguration and relocation costs” (internal quotation marks omitted)).

<sup>29</sup> Customer Commitment Ex Parte at 1 (describing customer commitments).

<sup>30</sup> Addendum, Section H at 47.

<sup>31</sup> See *supra* Section I.

### **III. THE COMMISSION SHOULD CREATE A VOLUNTARY PARTICIPATION STRUCTURE TO MEET A MINIMUM CLEARANCE TARGET OF 300 MHZ**

After initially proposing to clear only a modest 100 MHz of C-band spectrum available for flexible use, the most recent CBA plan belatedly proposes to make 200 MHz available. In support of this arbitrarily low number, the CBA argues it “strikes the appropriate balance between making available as much spectrum as possible that could be cleared for terrestrial mobile service in 18-36 months and ensuring that sufficient spectrum remains to support and protect incumbent users of C-band satellite service.”<sup>32</sup> But it is axiomatic that market demand should determine how much spectrum is cleared. TBN and LPN believe that the reallocation of C-band spectrum, if genuinely left to market forces, would naturally yield at least 300 MHz of spectrum clearance, given potential market participants’ desire for the reallocation to “provide channel sizes sufficiently large for 5G deployments and generate a sufficient number of licenses in each market to promote competition and investment.”<sup>33</sup>

As noted in Section I above, the transponder utilization rate for U.S. revenue-generating C-band satellites — which are owned by the four satellite operators that make up the CBA — is approximately 58%. Therefore, once the bottom 10 transponders (i.e., those in the lower 200 MHz) are cleared and C-band users are relocated to the leftover transponders (i.e., the top 14 in the leftover 300 MHz), the satellites are likely to be heavy loaded with very little idle capacity. In fact, Intelsat and SES have concluded that they will need to launch new satellites to accommodate all of the current C-band users.<sup>34</sup>

As an initial matter, in order to clear the initial 200 MHz, satellite operators, C-band users, and earth station operators will need to have their relocation costs covered, and each constituency will need to share in the excess economic value created through incentives. In order to clear more than 200 MHz, however, the Commission will need to take a fundamental leap and consider a process that offers additional incentives for C-band users to “relinquish” the use of the transponders on which they currently operate.

To this end, C-band users must be aggressively incented to *voluntarily* give up the use of all or a portion of a transponder while letting market mechanisms determine the value of clearing the additional transponders and associated spectrum. In exchange for a cash payout offer, C-

---

<sup>32</sup> Comments of the C-Band Alliance at 25, GN Docket No. 18-122 (filed Oct. 29, 2018) (“CBA Comments”).

<sup>33</sup> Notice of Ex Parte of the Competitive Carriers Association at 1, GN Docket No. 18-122 (filed Apr. 26, 2019).

<sup>34</sup> *But see* Letter from Comcast Corporation to Marlene H. Dortch, Secretary, FCC, Attachment at 3, GN Docket No. 18-122 (filed Apr. 30, 2019) (raising questions concerning “[w]hen and how can 8 new satellites be launched to preserve C-Band capacity” and whether “any of these satellites actually supplement the fleet, or merely replace sub-optimal satellites or those nearing end of life”).



band users should be allowed to do one or more of the following at a transponder level in coordination with the satellite operators:

- Completely relinquish the use of a transponder (i.e., “go off air”) and find new delivery solutions;<sup>35</sup>
- Completely relinquish the use of a transponder and transition to other bands, such as the Ku band;
- Share a transponder with another C-band user by entering into a “transponder sharing agreement”; and
- Make more efficient use of transponders through newer compression technologies.

A voluntary process — rather than one that is dictated by the Commission or the satellite operators — will allow market forces to decide how much additional spectrum beyond 200 MHz will ultimately be repurposed.

The broadcast incentive auction provides a helpful example for how incentives, when used properly, can lead to value-generative results and significant spectrum clearance. Rather than simply cover the costs of broadcasters’ relocation, the auction provided broadcasters with incentive payments as a means to encourage greater broadcaster participation in the reverse auction phase, which was necessary to clear a sufficient amount of spectrum to entice mobile carrier bids during the forward auction phase. This strategy proved to be a great success: the auction resulted in the clearance of 84 MHz of low-band spectrum, 70 MHz of which was repurposed for mobile broadband use nationwide.<sup>36</sup> Winning broadcaster bids in the reverse auction phase of the auction totaled more than \$10 billion, and more than \$7 billion was left for the U.S. Treasury after accounting for the costs associated with reverse auction winning bids, reimbursement payments for eligible parties, and auction operational expenses.<sup>37</sup> Wireless carriers also understood the power of incentives: following the auction’s completion, T-Mobile paid broadcasters significant sums to accelerate the transition of stations to new channels in order

---

<sup>35</sup> In deciding whether a particular cash payout is attractive, each C-band user may consider various factors such as termination liability associated with a transponder lease, the cost of other alternatives such as fiber, and the actual cost of relocation, to name a few.

<sup>36</sup> See Press Release, *Statement of FCC Chairman Tom Wheeler on Satisfying the Incentive Auction’s Final Stage Rule*, <https://docs.fcc.gov/public/attachments/DOC-343117A1.pdf>. The remainder of the spectrum was made available on an unlicensed basis for consumer devices and new services. See *id.*

<sup>37</sup> Public Notice, *Incentive Auction Closing and Channel Reassignment Public Notice*, 32 FCC Rcd. 2786, at \*2 (¶ 2) (rel. Apr. 13, 2017).

to free up spectrum for rapid broadband deployment.<sup>38</sup> These examples show just how effective incentives can be for repurposing spectrum for more flexible use.

#### **IV. THE COMMISSION SHOULD ADOPT A MARKET-BASED APPROACH THAT RECOGNIZES THE INTERESTS OF ALL C-BAND STAKEHOLDERS**

As noted in Section I above, given the proceeds likely to be generated from the sale of C-band spectrum, there should be more than enough value to be shared among all C-band stakeholders. However, the CBA proposal would lead to an egregious value grab, with roughly 99.5% of the sale proceeds going to CBA members for spectrum that they do not themselves own outright.<sup>39</sup> A wide range of stakeholders — from satellite operators to wireless carriers to radio and television broadcasters to cable companies to content producers — have highlighted the importance of a key constituency that the CBA proposal ignores entirely: earth station operators and users of C-band spectrum.<sup>40</sup> These stakeholders have significant commercial interests arising out of the reallocation of the C-band: for example, Comcast noted in a recent

---

<sup>38</sup> See, e.g., Letter from T-Mobile USA, Inc. to Marlene H. Dortch, Secretary, FCC, MB. Docket No. 16-306; GN Docket No. 12-268 (filed July 17, 2017) (volunteering to pay for low power stations affected by the broadcast incentive auction repack to move to temporary channels in order to clear broadcast spectrum as quickly as possible); Press Release, T-Mobile, T-Mobile and NBC's KXAS-TV Accelerate 600 MHz Repack (Mar. 14, 2018), <https://www.t-mobile.com/news/nbc-600-spectrum-repack> (reporting an agreement to accelerate the repacking of a Texas station more than a year in advance of a Commission-set repack deadline); Ben Munson, *CBS, T-Mobile Already Finished a 600 MHz Repack in New York*, FierceVideo (July 9, 2018, 12:11:PM), <https://www.fiercevideo.com/video/cbs-t-mobile-already-finished-a-600-mhz-repack-new-york-city> (reporting the successful repacking of a station in New York more than a year in advance of a Commission-set repack deadline).

<sup>39</sup> See SSO Ex Parte, Attachment at 8-9.

<sup>40</sup> See, e.g., SSO Reply Comments at 24 (“Because of the fragmented ownership of earth stations in the lower C-band, the Commission must provide financial incentives to ensure near-full cooperation.”); Comments of AT&T Services, Inc. at 10, GN Docket No. 18-122 (filed Oct. 29, 2018) (acknowledging “the highly valued C-band uses that have been documented in the record”); Notice of Ex Parte Communication of the National Association of Broadcasters at 2, GN Docket No. 18-122 (filed Apr. 10, 2019) (“In any move to reallocate a portion of the C-band to provide additional spectrum for expanded wireless operations, the Commission should take care to ensure that existing users — and the viewers and listeners who rely on them — are protected.”); Comments of Comcast Corporation and NBCUniversal Media, LLC at 26, GN Docket No. 18-122 (filed Oct. 29, 2018) (“Each dollar spent on protecting incumbent downstream users of the band is a dollar less received by the satellite operators in profit, thus creating incentives to cut corners.”); Comcast Ex Parte, Attachment at 1 (stating that “C-Band spectrum remains the ideal medium for video distribution; there is no comparable substitute”); Reply Comments of NCTA — The Internet & Television Association at 13, GN Docket No. 18-122 (filed Dec. 11, 2018) (“[I]ncumbent satellite operators would have every incentive to maximize profit and minimize costs, including costs to make existing users whole.”); ACA Reply Comments at 1-2 (“Perhaps most importantly, the Commission should fully take into account the rights not only of satellite operators but also of users. . . . [I]f the FCC were . . . to allow a satellite operator coalition to negotiate divestitures of C-band rights, this approach should be contingent on a coalition of users having a seat at the negotiating table, and on an agreement reached both by operators and users on the terms for relinquishing their use of a portion of the spectrum.”); Comments of the Content Companies at 5, GN Docket No. 18-122 (Oct. 29, 2018) (“[N]either the NPRM nor the CBA’s commitments go far enough to ensure that video delivery and the critical role FSS spectrum plays in the video marketplace will remain fully protected.”).

filing that approximately 84% of its cable channels' primary signals are received via the C-band, and that more than 114 million households rely on NBC affiliates' receipt of video via the C-band.<sup>41</sup> By excluding key stakeholders of the relevant market, the CBA proposal can hardly be called "market-based."

In the course of this proceeding, the small satellite operators have proposed a DSM approach whereby transition proceeds would be allocated to earth station operators, taxpayers, and satellite operators that are authorized to provide C-band satellite service in the United States.<sup>42</sup> A DSM-like approach provides for a fair distribution of transition proceeds and ensures that all C-band stakeholders will be eligible and incented to participate in the reallocation of the 3.7 to 4.2 GHz band. Importantly, with respect to earth station operators in particular, the small satellite operators' DSM approach calls not only for the reimbursement of direct and indirect costs associated with relocating such operators for band clearance purposes but also for separate incentive payments to be made to expedite the relocation of impacted operators.<sup>43</sup> Although the small satellite operators' preferred distributional allocations should be carefully assessed and may warrant revision, the overarching DSM concept serves the public interest by ensuring that all parties with interests in the C-band benefit from the reallocation of C-band spectrum.

The DSM approach espoused by the small satellite operators does not spell out the criteria for determining compensation for earth station operators. But there are many ways in which earth station operators could be fairly compensated under a DSM approach. As an example, a percentage of the revenue generated from the sale of C-band spectrum in each partial economic area ("PEA") could be set aside for earth station operators and C-band users and then apportioned using a formula based on some agreed-upon criteria. Under this approach, operators of earth stations located in densely populated areas of the PEAs should receive a greater share of the set-aside revenues. In another approach, earth station operators and C-band users would be apportioned some of the proceeds based on the level of effort involved in repurposing the spectrum. A group consisting of a C-band user (with one transponder) and 200 earth stations end points should be apportioned more proceeds compared to another group with only a handful of earth stations. Abiding by these tiered revenue apportionment structures would free up spectrum where it is most likely to be used, aligning with the manner in which wireless carriers commonly build out their networks.

It is important that taxpayers benefit directly from the C-band reallocation as well.<sup>44</sup> The CBA proposal does not place any of the value from the sale of C-band spectrum back into the

---

<sup>41</sup> See Comcast Ex Parte, Attachment at 1.

<sup>42</sup> See SSO Reply Comments at 21-26; SSO Ex Parte, Attachment at 4.

<sup>43</sup> SSO Reply Comments at 24.

<sup>44</sup> See, e.g., Comments of the Public Interest Spectrum Coalition at 22, GN Docket No. 18-122 (filed Oct. 29, 2018) ("A private auction or negotiated sale controlled by a few incumbent and foreign-based companies, and with no return of the anticipated net proceeds of \$10 to \$30 billion or more to the Treasury, amounts to a massive and

hands of the individuals who, through their tax dollars, subsidized satellite operators' acquisition of the spectrum in the first place.<sup>45</sup> This result stands in stark contrast with that produced by the broadcast incentive auction, "in which broadcasters received payment *and* taxpayers realized the benefit from the sale of the spectrum that reflected the enhanced transmission rights."<sup>46</sup> It is also contrary to well-established Commission precedent protecting the interests of taxpayers in spectrum policy matters.<sup>47</sup> By guaranteeing that American taxpayers get a slice of the C-band value pie, the DSM further demonstrates why its adoption would serve the public interest.

Small satellite operators, taxpayers, and earth station operators have legal standing to receive compensation under a DSM approach, and the Communications Act gives the Commission broad authority to ensure that these stakeholders are treated justly. Pursuant to Section 4(i) of the Act — informally referred to as the Act's "necessary and proper clause"<sup>48</sup> — the Commission is authorized to "perform any and all acts, make such rules and regulations, and issue such orders, not inconsistent with [the Act], as may be necessary in the execution of its functions."<sup>49</sup> In a prior filing, the small satellite operators have ably described why this clause gives the Commission the power to adopt a DSM-like approach, even in the absence of an express statutory directive.<sup>50</sup> As affirmed by the Supreme Court in its seminal *Brand X* opinion, where the Act may be silent or ambiguous with respect to a particular issue, the Commission's interpretation will be upheld so long as it is reasonable.<sup>51</sup> With respect to satellite operators and earth station operators in particular, T-Mobile has explained why the Commission has express

---

needless giveaway of public assets."); Letter for Taxpayers Protection Alliance to Chairman Ajit Pai, FCC, et al., (Apr. 10, 2019), *available at* <https://www.protectingtaxpayers.org/blog/a/view/14-free-market-groups-applaud-fcc-for-c-band-efforts> ("While the CBA claims this is a market-based approach, this could not be further from the truth. In reality, the CBA wants the FCC to allow foreign interests to monetize taxpayer-owned C-band spectrum through private sales that won't benefit taxpayers.").

<sup>45</sup> See Comments of T-Mobile USA, Inc. at 12, GN Docket No. 18-122 (filed Oct. 29, 2018) ("While satellite operators secured their spectrum at no cost, they will likely realize enormous returns from the sale of their spectrum.").

<sup>46</sup> *Id.*

<sup>47</sup> See 800 MHz Order at 15124 (¶ 329) (where the Commission required that Nextel Communications, Inc. would have to pay an "anti-windfall payment" to the U.S. Treasury to "cover any difference between the value of its credits and the value of spectrum rights in the 1.9 GHz band"). In 2017, the Commission lifted the anti-windfall payment provision, acknowledging that with nearly \$2.8 billion in creditable expenses, Sprint (the successor to Nextel) "ha[d] expended sufficient funds in fulfilling its 800 MHz rebanding commitments to preclude the windfall that the provision was intended to prevent." *Improving Safety Communications in the 800 MHz Band*, Declaratory Ruling, 32 FCC Rcd. 7528, 7528 (¶ 1) (2017).

<sup>48</sup> See, e.g., *Mobile Commc'ns Corp. of Am. v. FCC*, 77 F.3d 1399, 1404 (D.C. Cir. 1996).

<sup>49</sup> 47 U.S.C. § 154(i). Similar authority-granting language appears in Section 303(r) of the Act. See *id.* § 303(r) (authorizing the Commission to "[m]ake such rules and regulations and prescribe such restrictions and conditions, not inconsistent with law, as may be necessary to carry out the provisions of [the Act]").

<sup>50</sup> See Letter from the Small Satellite Operators to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-122 (filed Mar. 25, 2019).

<sup>51</sup> See *Nat'l Cable & Telecom. Ass'n v. Brand X Internet Servs.*, 545 U.S. 967, 980-81, 986 (2005) ("*Brand X*").

authority under Section 316 to modify the licenses of such entities in order to facilitate the reallocation of C-band spectrum.<sup>52</sup> Accordingly, there is no legal impediment to the Commission endorsing a DSM-like approach that serves all C-band stakeholders.

## **V. COMMISSION PRECEDENTS HIGHLIGHT THE NEED FOR AN INDEPENDENT TRANSITION FACILITATOR OPERATING UNDER FIRM RULES OF ENGAGEMENT**

Some of the challenges identified by TBN and LPN above could be remedied if the Commission established an independent Transition Facilitator operating under firm rules of engagement. A Transition Facilitator must be able to resolve any disputes among C-band stakeholders in a neutral and fair manner. Given the alignment of the CBA's interests with those of the four large satellite operators that make up its membership, the CBA should be disqualified from serving as the Transition Facilitator in this proceeding or selecting the party that serves in that role. The Commission should instead assign transition management authority to an independent Transition Facilitator that could administer disputes among large satellite operators, small satellite operators, earth station operators, and C-band users with integrity.

The lengthy and costly Local Number Portability Administrator ("LNPA") transition provides a cautionary tale for how a transition authority, once perceived as lacking sufficient neutrality and fairness, can be effectively rendered impotent. In that proceeding, the Commission gave the then-interim number portability administrator, North American Portability Management, LLC ("NAPM") unilateral authority to select a Transition Oversight Manager ("TOM") to oversee the transition,<sup>53</sup> and gave NAPM and the TOM decision-making status when it came to transition matters.<sup>54</sup> However, the TOM's lack of independence and specifically delineated authority to resolve disputes led to breakdowns between and among the incumbent LNPA, the incoming LNPA, and NAPM that prompted the Commission to reluctantly intervene to prevent further delays.<sup>55</sup>

---

<sup>52</sup> See Written Ex Parte Communication of T-Mobile USA, Inc., GN Docket No. 18-122 (filed Apr. 11, 2019).

<sup>53</sup> See LNPA Selection Order at 3150 (¶ 158) (instructing NAPM to "take all necessary steps to ensure that the transition is overseen by experienced third parties familiar with communications infrastructure, project management, and change management"); Letter from the North American Portability Management LLC to Chairman Ajit V. Pai, FCC, at 2, CC Docket No. 95-116; WC Docket Nos. 09-109, 07-149 (filed Aug. 31, 2015) (apprising the Commission of NAPM's selection of a TOM).

<sup>54</sup> See Public Notice, *Notice Concerning Ex Parte Status of Communications with Respect to the Local Number Portability Administrator Selection Proceeding*, at 1 n.2, WC Docket Nos. 07-149, 09-109; CC Docket No. 95-116 (rel. Aug. 18, 2015) (explaining that the TOM "is considered to be a subgroup of the NAPM LLC" and that "the NAPM and the TOM are serving as consultants to Commission staff and should be considered 'decision makers' for the purposes of our *ex parte* rules").

<sup>55</sup> See Letter from Chairman Ajit V. Pai, FCC, to Neustar, Inc. et al., CC Docket No. 99-200, 95-116, 92-237; WC Docket Nos. 09-109, 07-149 (filed Feb. 2, 2018) (chastising the parties for failing to meet key LNPA transition

Independence and specifically delineated authority are not a panacea, however. For proof, one need only look to the Transition Administrator (“TA”) in the 800 MHz rebanding proceeding that started in 2004. Although the TA’s neutrality was not in doubt and the Commission set forth clear rules to define the TA’s role in adjudicating disputes,<sup>56</sup> rebanding work remains ongoing nearly fifteen years later,<sup>57</sup> more than decade beyond the three-year time horizon initially prescribed by the Commission.<sup>58</sup> Such a significant delay is not surprising when the rules of engagement required the TA to be compensated regardless of whether it met its target completion deadline.<sup>59</sup> It would be devastating to America’s race to global leadership in 5G if a C-band Transition Facilitator were similarly not held accountable to strict deadlines. Taken together, the LNPA and 800 MHz rebanding proceedings suggest that transition managers are doomed to fail in the absence of clear rules of engagement that foster accountability, timeliness, cost-effectiveness, transparency, and integrity.

To this end, any solution that the Commission selects for the C-band reallocation must include a workable and meaningful mechanism for resolving disputes. The occurrence of such disputes is entirely foreseeable.<sup>60</sup> Because under the CBA plan the Transition Facilitator would be a participant in the spectrum reallocation process, it would lack the impartiality necessary to be the ultimate arbiter of disputes among C-band stakeholders. Accordingly, where more informal channels of negotiation break down, aggrieved parties should be able to raise complaints directly to the Commission. This approach is consistent with the degree of oversight

---

deadlines due to persistent disagreements over a contingency rollback plan). Indeed, even the NAPM itself expressed frustration with the disagreements and delays occurring on the watch of its own oversight manager. *See, e.g.*, Letter from the North American Portability Management LLC to Chairman Ajit V. Pai, FCC, WC Docket Nos. 07-149, 09-109; CC Docket No. 95-116 (filed Feb. 23, 2018) (reporting to the Commission that the parties’ dispute regarding a contingency rollback plan persisted, notwithstanding the parties’ participation in an intensive series of daily working sessions facilitated by the TOM).

<sup>56</sup> *See* 800 MHz Order at 15071-73 (¶¶ 194-196) (explaining that the TA “will serve both a ministerial role and a function similar to a special master in a judicial proceeding” and granting the TA specific authority to “[r]esolv[e] disputes between Nextel and licensee on cost estimates for reconfiguring a system” and “[f]acilitate resolution of disputes by mediation; or referral of the parties to alternate dispute resolution services”).

<sup>57</sup> *See* Letter from Sprint Corporation to David Furth, Public Safety and Homeland Security Bureau, FCC, at 1 (filed Apr. 1, 2019) (reporting that “Sprint and the remaining [sic] licensees for 800 MHz band reconfiguration continue to make significant progress in completing all of rebanding” and that “nine of the fifty-five NPSPAC Regions remain incomplete, with only three public safety licensees left in these remaining nine NPSPAC Regions”).

<sup>58</sup> 800 MHz Order at 15075 (¶ 201).

<sup>59</sup> *See id.* at 15067 (¶ 182) (directing Nextel to pay “its own relocation costs as well as such obligations such as . . . the compensation of the Transition Administrator”).

<sup>60</sup> *See* NPRM at 12 (¶ 29) (articulating the Commission’s own expectation that earth station operators and C-band users may reasonably disagree with the reimbursement amount that a Transition Facilitator sets for costs incurred by such entities during the C-band transition).

the Commission has exercised in past spectrum proceedings, and is essential to ensure that the Commission does not cede its authority in this transition.<sup>61</sup>

Relatedly, and as recommended by Global Eagle Entertainment Inc., the Transition Facilitator should also be required to submit to the Commission monthly reports that describe the status of negotiations with C-band stakeholders and identify the number of disputes referred to the Commission for resolution.<sup>62</sup> The CBA itself has expressed comfort with the idea of completing transition progress reports, which bolsters the argument that these reports should be mandated for any Transition Facilitator.<sup>63</sup> Requiring the submission of such reports would not only enhance transparency but also give the Commission the means by which to hold the Transition Facilitator accountable for its stewardship of the spectrum reallocation process.

## **VI. CONCLUSION**

TBN and LPN recognize the critical importance to America's strategic leadership in 5G of the timely reallocation of the 3.7 to 4.2 GHz band. Of course, a successful repurposing of the C-band requires consideration and resolution of a host of complicated issues. To more effectively address the inherent complexities, we urge the Commission to aim to repurpose a minimum of 300 MHz of C-band spectrum for flexible use and to adopt a DSM approach that ensures that the C-band reallocation takes full account of the interests of all C-band stakeholders as part of a fair, transparent and efficient process.

---

<sup>61</sup> See 800 MHz Order at 15071-72 (¶ 194).

<sup>62</sup> See Comments of Global Eagle Entertainment at 11, GN Docket No. 18-122 (filed Oct. 29, 2018).

<sup>63</sup> See CBA Comments at 23.

Ms. Marlene Dortch  
May 16, 2019  
Page 16

Respectfully submitted,

**TRINITY BROADCASTING NETWORK**

By: /s/ Colby May

Colby May  
Communications Counsel  
2442 Michelle Drive  
Tustin, CA 92780  
(202) 544-5171  
cmmay@maylawoffices.com

**LPN SPECTRUM LLC**

By: /s/ Ravi Potharlanka

Ravi Potharlanka  
CEO and Co-Founder  
6200 Stoneridge Mall Rd, Suite 300  
Pleasanton, CA 94588  
(415) 307-3528  
ravi@lpnspectrum.com

Enclosure

cc: Aaron Goldberger, Acting Wireless & International Advisor, Office of Chairman Pai  
Erin McGrath, Legal Advisor, Wireless, Public Safety and International, Office of  
Commissioner O’Rielly  
Will Adams, Legal Advisor, Office of Commissioner Carr  
Umair Javed, Legal Advisor, Wireless and International, Office of Commissioner  
Rosenworcel  
William Davenport, Chief of Staff & Senior Legal Advisor for Wireless and  
International, Office of Commissioner Starks  
Donald Stockdale, Bureau Chief, Wireless Telecommunications Bureau  
Tom Sullivan, Bureau Chief, International Bureau



Ms. Marlene Dortch  
May 16, 2019  
Page 17

Anna Gentry, Attorney Advisor, Mobility Division, Wireless Telecommunications  
Bureau  
Giulia McHenry, Acting Chief, Office of Economics and Analytics

ADDENDUM  
to  
Joint Ex Parte Filing by Trinity Broadcasting Network and LPN Spectrum LLC

# Table of Contents

<b><u>TITLE</u></b>	<b><u>PAGE NUMBER</u></b>
SECTION A — Spectrum Utilization	3
SECTION B — Spectrum Value Gap	8
SECTION C — 23 Satellites: Utilization Detail	12
SECTION D — Large Satellite Operator Utilization Summary: Intelsat	15
SECTION E — Large Satellite Operator Utilization Summary: SES	27
SECTION F — Large Satellite Operator Utilization Summary: Eutelsat	35
SECTION G — Large Satellite Operator Utilization Summary: Telesat	41
SECTION H — Reimbursement Estimates	46
SECTION I — Methodology and Sources	48
SECTION J — Addendum Author Profiles	51

SECTION A

Spectrum Utilization

## C-Band Spectrum (Downlink) – Utilization Metrics

### Allocated Spectrum: All Satellites Authorized for Service in the US [1]

Total C-Band Authorized Satellites with US Service	63
x Downlink Spectrum Authorized (MHz)	500
= Total Authorized Spectrum (Sat-MHz)	31,500

### Used Spectrum: Satellites that Appear To Deliver Service to US Earth Stations [2]

Number of Satellites with US Customers	23
x Downlink Spectrum Authorized (MHz)	500
= Total Authorized Spectrum with US Customers (Sat-MHz)	11,500
<b><i>Spectrum Usage %</i></b>	<b>37%</b>

### Transponder Utilization on 23 Satellites [3]

Utilized Transponders (Adjusted)	318
÷ Total Available Transponders	552
= Utilization Percentage	<b>58%</b>
x Spectrum Usage %	37%
= <b><i>Implied Total Actual Spectrum Usage %</i></b>	<b>21%</b>

# Utilization Metrics: Notes [1], [2], [3]

[1] C-Band Authorized Satellites determined using the following methodology:		Satellite Count
a. Download Space Station Approval List from FCC International Bureau: <a href="https://www.fcc.gov/approved-space-station-list">https://www.fcc.gov/approved-space-station-list</a> . List downloaded 4/24/19. List last revised by FCC on 12/3/18. [223 satellites]		223
b. Filter for satellites that are authorized to operate in downlink C-Band between 3700-4200 [-134 satellites; 89 remaining]	-134	89
c. Remove satellites not covering CONUS [-16 satellites; 73 remaining]	-16	73
d. Remove in-transition or deorbited satellites [-3 satellites; 70 remaining]	-3	70
e. Remove satellites that have been replaced by another satellite [-5 satellites; 65 remaining]	-5	65
f. Remove planned replacement satellites not yet launched [-2 satellites; 63 remaining]	-2	63
[2] Satellites with US Customers are based on list of satellites listed in ex parte filings		Satellite Count
a. 16 satellites for Intelsat and SES (2/7/19 Ex Parte filing on satellite grooming). 18 satellites were presented and for this analysis, the SES spare satellite at orbital slot 103W and SES new satellite at 135W were removed		16
b. 4 satellites for Eutelsat (4/9/19 Ex Parte filing on satellite grooming)		4
c. 3 satellites for Telesat (4/11/19 Ex Parte filing on satellite grooming)		3
[3] Transponder Utilization		
The utilization percentage for the 23 satellites is calculated using data from LyngSat (downloaded 4/28/19) and is result of "Total Transponders with at least 1 US customer (295)+ one backup transponder per satellite (23) = (318)" divided by "Total Available Transponders (23x24 = 552)"		(318)/(552) = 58%

## 23 Main Satellites: Subject to Regrooming for C-Band Transition

Company	Orbital Position	Satellite Name	Administration	Call Sign	In Service Year	Grooming Plan?
Intelsat	127 W.L.	GALAXY 13	U.S.A.	S2386	2003	x
Intelsat	125 W.L.	GALAXY 14	U.S.A.	S2385	2006	x
Intelsat	133 W.L.	GALAXY 15	U.S.A.	S2387	2005	x
Intelsat	99 W.L.	GALAXY 16	U.S.A.	S2687	2006	x
Intelsat	91 W.L.	GALAXY 17	U.S.A.	S2715	2008	x
Intelsat	123 W.L.	GALAXY 18	U.S.A.	S2733	2008	x
Intelsat	97 W.L.	GALAXY 19	U.S.A.	S2647	2008	x
Intelsat	121 W.L.	GALAXY 23	Papua New Guinea	S2592	2003	x
Intelsat	89 W.L.	GALAXY 28 (TELSTAR 8, IA-8)	U.S.A.	S2160	2005	x
Intelsat	95.05 W.L.	GALAXY 3C	U.S.A.	S2381	2002	x
SES	131 W.L.	AMC-11 (GE-11)	U.S.A.	S2433	2004	x
SES	139 W.L.	AMC-8 / AURORA III	U.S.A.	S2379	2001	x
SES	101 W.L.	SES-1	U.S.A.	S2807	2010	x
SES	104.95 W.L.	SES-11	Gibraltar (4/6 GHz)   U.S.A. (12/14 GHz)	S2964	2017	x
SES	87 W.L.	SES-2	U.S.A.	S2826	2011	x
SES	103 W.L.	SES-3	U.S.A.	S2892	2011	x
Eutelsat	113 W.L.	EUTELSAT 113 WA	Mexico	S2695	2006	x
Eutelsat	114.9 W.L.	EUTELSAT 115 WB (SATMEX 7)	Mexico	S2938	2015	x
Eutelsat	116.8 W.L.	EUTELSAT 117 WA (SATMEX 8)	Mexico	S2873	2013	x
Eutelsat	172 E.L.	EUTELSAT 172B	U.S.A.	S3021	2017	x
Telesat	107.3 W.L.	ANIK F1R	Canada	S2674	2005	x
Telesat	111.1 W.L.	ANIK F2	Canada	S2646	2004	x
Telesat	118.7 W.L.	ANIK F3	Canada	S2703	2007	x

# 40 Other Satellites (63-23=40): Not Impacted by C-Band Transition

Company	Orbital Position	Satellite Name	Administration	Call Sign	In Service Year	Grooming Plan?
ABS	3 W.L.	ABS-3A	Russian Federation / Intersputnik	S2987	2015	
Empresa Argentina	81.0 W.L.	ARSAT-2	Argentina	S2956	2015	
Eutelsat	174 E.L.	EUTELSAT 174A	U.S.A.	S2610	2006	
Hispasat	61 W.L.	AMAZONAS-3	Brazil	S2886	2013	
Intelsat	129 W.L.	GALAXY 12	U.S.A.	S2422	2003	
Intelsat	93.1 W.L.	GALAXY 25 (INTELSAT AMERICAS 5)	U.S.A.	S2154	1997	
Intelsat	169 E.L.	HORIZONS-3e	U.S.A.	S2947	2019	
Intelsat	47.5 E.L.	INTELSAT 10 (IS-10)	U.S.A.	S2382	2001	
Intelsat	1 W.L.	INTELSAT 10-02 (PAS-10)	U.S.A.	S2414	2004	
Intelsat	43 W.L.	INTELSAT 11	U.S.A.	S2237	2008	
Intelsat	45 W.L.	INTELSAT 14	U.S.A.	S2785	2009	
Intelsat	180 E.L.	INTELSAT 18	U.S.A.	S2817	2011	
Intelsat	166 E.L.	INTELSAT 19	U.S.A.	S2850	2012	
Intelsat	157.1 E.L.	INTELSAT 1R (PAS-1R)	U.S.A.	S2368	2000	
Intelsat	58 W.L.	INTELSAT 21	U.S.A.	S2863	2012	
Intelsat	53 W.L.	INTELSAT 23	U.S.A.	S2831	2012	
Intelsat	31.5 W.L.	Intelsat 25	U.S.A.	S2804	2010	
Intelsat	50 W.L.	INTELSAT 29E	U.S.A.	S2913	2016	
Intelsat	55.5 W.L.	INTELSAT 34	U.S.A.	S2915	2015	
Intelsat	34.5 W.L.	Intelsat 35e	U.S.A.	S2959	2017	
Intelsat	18 W.L.	INTELSAT 37e	U.S.A.	S2972	2018	
Intelsat	137.0 W.L.	INTELSAT 5 (PAS-5)	U.S.A.	S2704	1997	
Intelsat	29.5 W.L.	INTELSAT 901	U.S.A.	S2405	2001	
Intelsat	31.5 W.L.	INTELSAT 903	U.S.A.	S2407	2002	
Intelsat	24.5 W.L.	INTELSAT 905	U.S.A.	S2409	2002	
Intelsat	27.5 W.L.	INTELSAT 907 (INTELSAT AOR)	U.S.A.	S2411	2003	
SES	130.9 W.L.	AMC-1	U.S.A.	S2445	1996	
SES	139 W.L.	AMC-18	Gibraltar	S2713	2006	
SES	84.85 W.L.	AMC-2	U.S.A.	S2134	2001	
SES	72 W.L.	AMC-3 (GE-4)	U.S.A.	S2162	1997	
SES	134.9 W.L.	AMC-4 (GE 3)	U.S.A.	S2135	1999	
SES	83 W.L.	AMC-6	U.S.A.	S2347	2000	
SES	135 W.L.	AMC-7	U.S.A.	S2155	2000	
SES	37.45 W.L.	NSS-10	U.S.A.	S2415	2005	
SES	20 W.L.	NSS-7	Netherlands	S2463	2002	
SES	177 W.L.	NSS-9	Netherlands	S2756	2009	
SES	47.5 W.L.	SES-14	Brazil and Netherlands	S2974	2018	
SES	22 W.L.	SES-4	Netherlands	S2828	2012	
SES	40.5 W.L.	SES-6	Netherlands	S2870	2013	
Star One	65 W.L.	STAR ONE C1	Brazil	S2677	2007	



## SECTION B

### Spectrum Value Gap

# Estimated Value of C-Band Spectrum (Downlink) in Satellite Use

US C-Band Satellite Valuation		
US Revenue in C-Band (\$Mil) <sup>(1)</sup>	\$	340
EBITDA Margin % <sup>(2)</sup>	x	71%
EBITDA (\$Mil)	\$	241
EBITDA Multiple <sup>(3)</sup>	x	8.25
<b>EV of US C-Band (\$Mil)</b>	<b>\$</b>	<b>1,990</b>
<b>Allocated Downlink Spectrum (MHz)</b>		<b>500</b>
<b>US Population (Mil)</b>		<b>325.01</b>
<b>Implied \$/MHz Pop <sup>(4)(5)</sup></b>	<b>\$</b>	<b>0.012</b>

(1) Source: Satellite Industry Association comments in FCC GN Docket No. 17-183 dated 10/2/17

(2) Average EBITDA margins from the following sources:

- a. Goldman Sachs Equity Report dated 3/21/19 for Intelsat
- b. Intelsat 6K filed 4/30/19
- c. SES 2018 Annual Financial Results 3/1/19
- d. Morgan Stanley Equity Report dated 10/11/18 for SES
- e. Kerrisdale Equity Report dated June 2018 for Intelsat & SES

(3) Average EV/EBITDA multiple from the following sources:

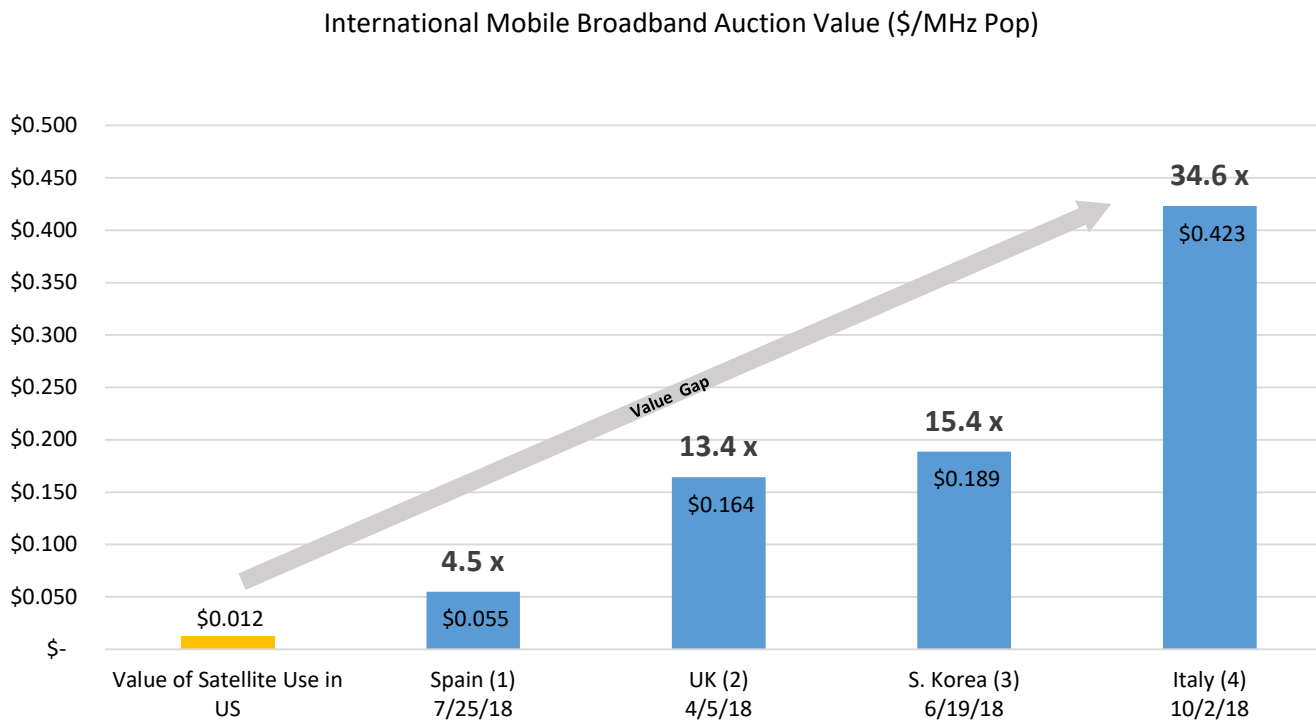
- a. Goldman Sachs Equity Report dated 3/21/19 for Intelsat. EV/EBITDA using 2019E EBITDA
- b. Morgan Stanley Equity Report dated 10/11/18 for SES. EV/EBITDA using base case 2018 EBITDA
- c. Kerrisdale Equity Report dated June 2018 for Intelsat & SES

(4) MHz Pop calculated as 500 MHz times US Population. This figure then divided by calculated US C-Band EV

(5) US Population as of 7/1/18. Source: U.S. Census Bureau, Population Division.

Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2018 (NST-EST2018-01). Website: <https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html>

# Midband Spectrum Valuations from Recent Auctions Outside the US



(1) Spain auction data from Auction Result Announcement from Ministerio de Economía y Empresa on 7/25/18. Exchange rate as of 6/18/18 per Oanda

(2) UK auction data from Ofcom official notice from 4/5/18 and 4/13/18. <https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-archive/2-3-and-3-4-ghz-auction>. Exchange rate as of 4/4/18 per Oanda

(3) S. Korea auction data from TeleGeography article dated 6/19/18 titled "MSIT announces results of 5G spectrum auction". Exchange rate as of 6/18/18 per Oanda

(4) Italy auction data from Ministry of Economic Development 10/2/18. Exchange rate as of 9/30/18 per Oanda

# Estimated Sale Proceeds: C-Band Spectrum for Mobile Broadband Use

## Possible Proceeds Available to All Current C-Band Stakeholders

*(\$ billions)*

Assumes US Pop = 325m people

\$/MHz Pop	MHz Cleared				
	200	250	300	350	400
<b>\$0.20</b>	\$13.0	\$16.3	\$19.5	\$22.8	\$26.0
<b>\$0.25</b>	\$16.3	\$20.3	\$24.4	\$28.4	\$32.5
<b>\$0.30</b>	\$19.5	\$24.4	\$29.3	\$34.1	\$39.0
<b>\$0.35</b>	\$22.8	\$28.4	\$34.1	\$39.8	\$45.5
<b>\$0.40</b>	\$26.0	\$32.5	\$39.0	\$45.5	\$52.0
<b>\$0.45</b>	\$29.3	\$36.6	\$43.9	\$51.2	\$58.5
<b>\$0.50</b>	\$32.5	\$40.6	\$48.8	\$56.9	\$65.0

## SECTION C

### 23 Satellites: Utilization Detail

# Large Satellite Operator Satellite Overview

CBA Member Overview		Satellite Stats			Utilization Stats (23 Satellites with Regrooming Plans)				
Company	HQ	No. of US Serving Satellites	US Licensed	Foreign Licensed	Satellites with US Customers	Transponder Count (1)	Transponders with US Customers (2)	Transponders with US Customers + Spare (3)	% Utilization
Intelsat	Luxembourg	32	31	1	10	240	154	164	68%
SES	Luxembourg	19	12	7	6	144	82	88	61%
Eutelsat	Paris, France	5	2	3	4	96	42	46	48%
Telesat	Ottawa, Canada	3	0	3	3	72	17	20	28%
<b>Total</b>		<b>59</b>	<b>45</b>	<b>14</b>	<b>23</b>	<b>552</b>	<b>295</b>	<b>318</b>	<b>58%</b>

**Source Data:** Utilization information developed from publicly available data from LyngSat as of 4/28/19. SES 2 TP17, SES 11 TP1, TP11, TP21 are used for radio and are sourced by TVROSat as of 5/9/19

(1) Assumes standardized 24 transponder at 36 MHz for each satellite

(2) As long as transponder has at least one customer, it is counted, regardless of whether it uses full 36 MHz

(3) One additional spare transponder per satellite assumed to be used for backup and occasional use

# Transponder Usage Summary (23 Satellites with Regrooming Plans)

Orbital Slot	Company	Satellite	Occupied	Empty	Utilization	TP 1 TP 2	TP 3 TP 4	TP 5 TP 6	TP 7 TP 8	TP 9 TP 10	TP 11 TP 12	TP 13 TP 14	TP 15 TP 16	TP 17 TP 18	TP 19 TP 20	TP 21 TP 22	TP 23 TP 24
87 W	SES	SES 2	7	17	29%		C		C	C				C			C
89 W	Intelsat	Galaxy 28	10	14	42%		C						C				C
91 W	Intelsat	Galaxy 17	21	3	88%	C	C	C	C	C		C	C	C		C	C
95 W	Intelsat	Galaxy 3C	17	7	71%		C	C	C	C		C	C	C	C	C	C
97 W	Intelsat	Galaxy 19	22	2	92%	C	C	C	C	C	C	C	C	C	C	C	C
99 W	Intelsat	Galaxy 16	16	8	67%		C	C	C	C	C	C	C	C	C	C	C
101 W	SES	SES 1	19	5	79%	C	C		C	C	C				C	C	
103 W	SES	SES 3	19	5	79%	C	C	C	C		C	C	C	C	C	C	C
105 W	SES	SES 11	20	4	83%	C		C	C	C	C	C	C		C	C	C
107.3 W	Telesat	Anik F1R	8	16	33%		C	C	C			C		C	C		
111.1 W	Telesat	Anik F2	8	16	33%	C		C		C	C		C	C	C		
113 W	Eutelsat	Eutelsat 113 West A	17	7	71%	C	C	C	C	C		C	C	C	C		C
115 W	Eutelsat	Eutelsat 115 West B	1	23	4%						C						
117 W	Eutelsat	Eutelsat 117 West A	21	3	88%	C	C	C	C	C	C	C	C	C	C	C	C
118.7 W	Telesat	Anik F3	1	23	4%						C						
121 W	Intelsat	Galaxy 23	9	15	38%		C		C	C	C		C			C	C
123 W	Intelsat	Galaxy 18	4	20	17%								C	C	C	C	
125 W	Intelsat	Galaxy 14	22	2	92%	C	C	C	C	C	C	C	C	C	C	C	C
127 W	Intelsat	Galaxy 13	15	9	63%		C	C	C	C	C	C	C	C	C	C	C
131 W	SES	AMC 11	16	8	67%		C	C	C	C	C		C	C	C	C	C
133 W	Intelsat	Galaxy 15	18	6	75%	C		C				C	C	C	C	C	C
139 W	SES	AMC 8	1	23	4%									C			
172 E	Eutelsat	Eutelsat 172B	3	21	13%				C			C					
<b>Total</b>			<b>295</b>	<b>257</b>	<b>53%</b>												
<b>Avg Per Satellite</b>			<b>12.8</b>	<b>11.2</b>													
<b>Total (including backup transponder) (1)</b>			<b>318</b>	<b>234</b>	<b>58%</b>												
<b>Avg Per Satellite</b>			<b>13.3</b>	<b>9.8</b>													

Customer Occupied  
Not Used

Source Data: Chart developed from publicly available data from LyngSat as of 4/28/19. SES 2 TP17, SES 11 TP1, TP11, TP21 are used for radio and are sourced by TVROSat as of 5/9/19

(1) To account for backup and occasional use, assumed each satellite assigns one transponder as spare. With 23 satellites in this analysis, this adds 23 satellites to the total occupied transponders

## SECTION D

### Large Satellite Operator Utilization Summary: Intelsat



# Transponder Usage: Intelsat

Orbital Slot	Company	Satellite	Occupied	Empty	Utilization	TP 1 TP 2	TP 3 TP 4	TP 5 TP 6	TP 7 TP 8	TP 9 TP 10	TP 11 TP 12	TP 13 TP 14	TP 15 TP 16	TP 17 TP 18	TP 19 TP 20	TP 21 TP 22	TP 23 TP 24
89 W	Intelsat	Galaxy 28	10	14	42%				C	C	C		C				C
									C	C		C	C	C			C
91 W	Intelsat	Galaxy 17	21	3	88%	C	C	C	C	C		C	C	C		C	C
						C	C	C	C		C	C	C	C	C	C	C
95 W	Intelsat	Galaxy 3C	17	7	71%			C	C	C	C		C	C	C	C	C
							C	C		C	C	C	C	C		C	C
97 W	Intelsat	Galaxy 19	22	2	92%	C	C	C	C	C	C	C	C		C	C	C
						C	C	C		C	C	C	C	C	C	C	C
99 W	Intelsat	Galaxy 16	16	8	67%				C		C	C	C		C	C	C
							C	C		C	C	C	C	C		C	C
121 W	Intelsat	EchoStar 9/Galaxy 23	9	15	38%				C	C	C		C				
							C				C		C			C	C
123 W	Intelsat	Galaxy 18	4	20	17%									C			
													C		C	C	
125 W	Intelsat	Galaxy 14	22	2	92%	C	C	C	C	C	C	C		C	C	C	C
						C	C	C	C	C	C	C	C		C	C	C
127 W	Intelsat	Galaxy 13/Horizons 1	15	9	63%		C		C	C	C	C	C		C	C	C
							C	C		C		C	C	C		C	
133 W	Intelsat	Galaxy 15	18	6	75%	C		C					C	C	C	C	C
						C	C	C	C	C		C	C	C	C	C	C
<b>Total</b>			<b>154</b>	<b>86</b>	<b>64%</b>												
<b>Avg Per Satellite</b>			<b>15.4</b>	<b>8.6</b>													
<b>Total (including backup transponder) (1)</b>			<b>164</b>	<b>76</b>	<b>68%</b>												
<b>Avg Per Satellite</b>			<b>16.4</b>	<b>7.6</b>													

	Customer Occupied
	Not Used

Source Data: Chart developed from publicly available data from LyngSat as of 4/28/19

(1) To account for backup and occasional use, assumed each satellite assigns one transponder as spare. With 10 satellites in this analysis, this adds 10 satellites to the total occupied transponders

# Satellite Profile: Galaxy 28

Assessment Date	5/1/2019
Satellite	Galaxy 28
Orbital Location	89 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jun 2005	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	10	Transponders w/ at least 1 US Customer	4
Expected Life	15.0 yrs				
Est. End of Life Date	Jun 2020				
Years Left (2)	1.1 yrs	Transponder Utilization	42%	Transponder Utilization	40%

## Transponder Detail (Customer Information)

1		2		3		4		5		6	
7	(feeds)	8	(Various)*	9	(CBS feeds)	10	(CBS feeds)	11	(CBS feeds)	12	
13		14	(CBS feeds)	15	(CBN feeds) CBN News	16		17		18	(CW feeds)
19		20		21		22		23	(feeds) Bolivian mux	24	(feeds)

### \* Programming details for Transponders with "(Various)" broadcasters

TP 8: Arouse, Event TV HD, Event TV SD, Vubiquity PPV 2

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 17

Assessment Date	5/1/2019
Satellite	Galaxy 17
Orbital Location	91 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jul 2008	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	21	Transponders w/ at least 1 US Customer	9
Expected Life	15.0 yrs				
Est. End of Life Date	Jul 2023				
Years Left (2)	4.2 yrs	Transponder Utilization	88%	Transponder Utilization	90%

## Transponder Detail (Customer Information)

1 The CW Plus	2 Fox Networks Group	3 NBC Sports Chicago SportsNet New York	4 MLB Network	5 Fox Networks Group	6 Fox Networks Group
7 Comcast Entertainment...	8 Fox Sports Networks	9 (Various)* The Word Network	10	11	12 BYU TV KLUZ-TV (Univisión -... Roberts Communication...
13 MASN	14 TCT	15 Spectrum	16 Fox Networks Group	17 Fox Sports Networks	18 Classic Arts Showcase
19	20 (Various)*	21 (feeds)	22 Fox Sports Networks	23 (Various)*	24 International Media D...

### \* Programming details for Transponders with "(Various)" broadcasters

TP 9: Altitude, Altitude 2, Outdoor Channel, Sportsman Channel, Sportsman Channel Canada

TP 20: [AT&T SportsNet test card], AT&T SportsNet Pittsburgh, AT&T SportsNet Pittsburgh Alternate, AT&T SportsNet Rocky Mountain, AT&T SportsNet Rocky Mountain Alternate, AT&T SportsNet Rocky Mountain Alternate 2, AT&T SportsNet Southwest, AT&T SportsNet Southwest Alternate, Root Sports Northwest, Root Sports Northwest Alternate

TP 23: Big Ten Network, SportsTime Ohio

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 3C

Assessment Date	5/1/2019
Satellite	Galaxy 3C
Orbital Location	95.05 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jun 2002	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	17	Transponders w/ at least 1 US Customer	6
Expected Life	15.0 yrs				
Est. End of Life Date	Jun 2017				
Years Left (2)	End of Life	Transponder Utilization	71%	Transponder Utilization	60%

## Transponder Detail (Customer Information)

1		2		3		4	(feeds)	5	(feeds)	6	(feeds)
7	(feeds)	8		9	(feeds)	10	(Various)*	11	(feeds)	12	(Various)*
13		14	(Various)*	15	(ABC feeds)	16		17	(feeds)	18	(Fox feeds)
19	(Fox feeds)	20		21	(feeds)	22	(feeds)	23	(feeds)	24	Info 7

### \* Programming details for Transponders with "(Various)" broadcasters

TP 10: (Roberts Communications feeds)

TP 12: (Roberts Communications feeds)

TP 14: (Roberts Communications feeds)

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 19

Assessment Date	5/1/2019
Satellite	Galaxy 19
Orbital Location	97 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Nov 2008	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	22	Transponders w/ at least 1 US Customer	9
Expected Life	15.0 yrs				
Est. End of Life Date	Nov 2023				
Years Left (2)	4.6 yrs	Transponder Utilization	92%	Transponder Utilization	90%

## Transponder Detail (Customer Information)

1 (feeds)	2 (feeds)	3 Azteca	4 (feeds)	5 (feeds) Azteca	6 Imagen TV
7 (Various)*	8	9 (feeds)	10 (feeds) (Various)*	11 LDS Church	12 Encompass
13 (Various)*	14 (Various)*	15 (Various)*	16 (feeds)	17	18 (CBS feeds)
19 (CBS feeds)	20 (CBS feeds)	21 (feeds)	22 (CBS feeds)	23 (CBS feeds)	24 (feeds)

### \* Programming details for Transponders with "(Various)" broadcasters

TP 7: (feeds), AMG TV, LATV, The Walk TV

TP 10: Bounce, Escape, Grit, Laff

TP 13: Bounce, Court TV, Escape, Grit, Laff

TP 14: CBC New Brunswick, Ici Radio Canada Télé Nouveau-Brunswick, Télé-Québec

TP 15: FootSchool TV Americas, Regional Music TV, Telecentro (Dominican Republic)

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 16

Assessment Date	5/1/2019
Satellite	Galaxy 16
Orbital Location	99 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Aug 2006	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	16	Transponders w/ at least 1 US Customer	4
Expected Life	15.0 yrs				
Est. End of Life Date	Aug 2021				
Years Left (2)	2.3 yrs	Transponder Utilization	67%	Transponder Utilization	40%

## Transponder Detail (Customer Information)

1		2		3		4	(feeds)	5		6	Cox Sports TV Louisia...
7	(Various)*	8		9		10	American Forces Netwo...	11	(Televisa feeds)	12	(feeds)
13	(feeds)	14	(feeds)	15	LESEA	16	Shepherd's Chapel	17		18	(Fox feeds)
19	(feeds)	20		21	(ABC feeds)	22	(ABC feeds)	23	(feeds)	24	(feeds)

### \* Programming details for Transponders with "(Various)" broadcasters

TP 7: Believer's Voice of Victory Network, Cornerstone TV, WAPA America

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 23

Assessment Date	5/1/2019
Satellite	Galaxy 23
Orbital Location	121 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Aug 2003	Serving C-Band			
Administration	Papua New Guinea				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	9	Transponders w/ at least 1 US Customer	3
Expected Life	15.0 yrs				
Est. End of Life Date	Aug 2018				
Years Left (2)	End of Life	Transponder Utilization	38%	Transponder Utilization	30%

## Transponder Detail (Customer Information)

1		2		3		4	CenturyLink	5		6	
7	MX1	8		9	BabyFirst TV	10		11	MX1	12	Jewish Life TV
13		14		15	Encompass	16	The Erotic Networks	17		18	
19		20		21		22	(Various)*	23		24	IKO MG RTVE

### \* Programming details for Transponders with "(Various)" broadcasters

TP 22: Antena 3 Internacional, Atreseries, Beln Sports en Español, Beln Sports USA, Centroamérica TV, Cinema Dinamita, HITN, Hola! TV Estados Unidos, Pasiones Estados Unidos, Semillitas TV, TV Dominicana, TyC Sports, ViendoMovies Este, ViendoMovies Oeste

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 18

Assessment Date	5/1/2019
Satellite	Galaxy 18
Orbital Location	123 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jun 2008	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	4	Transponders w/ at least 1 US Customer	0
Expected Life	15.0 yrs				
Est. End of Life Date	Jun 2023				
Years Left (2)	4.1 yrs	Transponder Utilization	17%	Transponder Utilization	0%

## Transponder Detail (Customer Information)

1		2		3		4		5		6	
7		8		9		10		11		12	
13		14		15		16	Pac-12	17	Viacom Media Networks...	18	
19		20	ESPN Bristol Pod	21		22	ESPN	23		24	

## \* Programming details for Transponders with "(Various)" broadcasters

N/A

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019



# Satellite Profile: Galaxy 14

Assessment Date	5/1/2019
Satellite	Galaxy 14
Orbital Location	125 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jan 2006	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	22	Transponders w/ at least 1 US Customer	10
Expected Life	15.0 yrs				
Est. End of Life Date	Jan 2021				
Years Left (2)	1.7 yrs	Transponder Utilization	92%	Transponder Utilization	100%

## Transponder Detail (Customer Information)

1	Trinity Broadcasting	2	AMC Networks	3	Evine	4	NBC Universal	5	(Various)*	6	Turner
7	ABC Cable Networks	8	HBO The Works	9	ESPN	10	(Various)*	11	ABC Cable Networks	12	C-SPAN
13	(Various)*	14	ESPN	15		16	HBO The Works	17	Turner	18	
19	NBC Universal	20	BET Networks	21	A&E Networks	22	Music Choice	23	A&E Networks	24	Showtime HD East Plex...

### \* Programming details for Transponders with "(Various)" broadcasters

TP 5: AMC Canada, Blaze TV, Outside TV

TP 10: America's Value Channel (17-22 ET), CBeebies Latinoamérica, Cine Sony, Fox Life Latin, Gospel Broadcasting Network, MavTV, Newsmax TV, NTD TV East, Shop LC, Sony Movie Channel USA, This TV Network

TP 13: [test card], Antenna TV, This TV Network, WGN America East, WGN America West, WGN Radio

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 13

Assessment Date	5/1/2019
Satellite	Galaxy 13
Orbital Location	127 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Oct 2003	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	15	Transponders w/ at least 1 US Customer	6
Expected Life	15.0 yrs				
Est. End of Life Date	Oct 2018				
Years Left (2)	End of Life	Transponder Utilization	63%	Transponder Utilization	60%

## Transponder Detail (Customer Information)

1		2		3	HDNet	4	(Various)*	5		6	(Various)*
7	A&E Networks	8		9	Starz	10	BBC World News Americ...	11	NASA TV	12	
13	Encompass	14	Discovery Networks	15	Starz	16		17		18	Apostolic Oneness Net... Herring Networks MBC America
19	HDNet	20		21	NFL	22	Discovery Networks	23	Encompass	24	

### \* Programming details for Transponders with "(Various)" broadcasters

TP 4: BBC World News Americas, Caracol TV Internacional, Mega TV (USA), NHK World Japan, TV Japan

TP 6: Bloomberg TV US, Eleven Sports USA, Playboy TV en Español, Playboy TV USA HD, Reelz, WWE Network

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Galaxy 15

Assessment Date	5/1/2019
Satellite	Galaxy 15
Orbital Location	133 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Intelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Oct 2005	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	18	Transponders w/ at least 1 US Customer	7
Expected Life	15.0 yrs				
Est. End of Life Date	Oct 2020				
Years Left (2)	1.5 yrs	Transponder Utilization	75%	Transponder Utilization	70%

## Transponder Detail (Customer Information)

1 AMC Networks	2 Fox Networks Group	3	4 Fox Sports Networks	5 EWTN	6 Pop
7	8 Starz	9	10 Fox Networks Group	11	12
13	14 Starz	15 Turner	16 Turner	17 Media-Comm	18 HBO The Works
19 HBO The Works	20 Fox Sports Networks	21 Fox Sports Networks	22 Fox Sports Networks	23 (Various)* HBO The Works	24 NBC Universal

### \* Programming details for Transponders with "(Various)" broadcasters

TP 23: Fox Business, Fox News Channel

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

## SECTION E

### Large Satellite Operator Utilization Summary: SES

# Transponder Usage: SES

Orbital Slot	Company	Satellite	Occupied	Empty	Utilization	TP 1 TP 2	TP 3 TP 4	TP 5 TP 6	TP 7 TP 8	TP 9 TP 10	TP 11 TP 12	TP 13 TP 14	TP 15 TP 16	TP 17 TP 18	TP 19 TP 20	TP 21 TP 22	TP 23 TP 24
87 W	SES	SES 2	7	17	29%		C		C	C				C			C
							C										C
101 W	SES	SES 1	19	5	79%	C	C		C	C	C				C	C	
						C	C	C	C	C	C	C	C	C	C	C	C
103 W	SES	SES 3	19	5	79%	C	C	C	C		C	C	C	C	C	C	C
							C		C	C	C	C	C			C	C
105 W	SES	AMC 15 & EchoStar 105/SES 11	20	4	83%	C		C	C	C	C	C	C		C	C	C
						C	C	C	C	C	C	C	C	C	C		
131 W	SES	AMC 11	16	8	67%		C	C	C	C	C		C		C		C
							C		C	C	C		C	C	C	C	
139 W	SES	AMC 8	1	23	4%												
														C			
<b>Total</b>			<b>82</b>	<b>62</b>	<b>57%</b>												
<b>Avg Per Satellite</b>			<b>13.7</b>	<b>10.3</b>													
<b>Total (including backup transponder) (1)</b>			<b>88</b>	<b>56</b>	<b>61%</b>												
<b>Avg Per Satellite</b>			<b>14.7</b>	<b>9.3</b>													

	Customer Occupied
	Not Used

Source Data: Chart developed from publicly available data from LyngSat as of 4/28/19. SES 2 TP17, SES 11 TP1, TP11, TP21 are used for radio and are sourced by TVROSat as of 5/9/19

(1) To account for backup and occasional use, assumed each satellite assigns one transponder as spare. With 6 satellites in this analysis, this adds 6 satellites to the total occupied transponders

# Satellite Profile: SES 2

Assessment Date	5/1/2019
Satellite	SES 2
Orbital Location	87 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	SES	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Oct 2011	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	7	Transponders w/ at least 1 US Customer	4
Expected Life	15.0 yrs				
Est. End of Life Date	Oct 2026				
Years Left (2)	7.5 yrs	Transponder Utilization	29%	Transponder Utilization	40%

## Transponder Detail (Customer Information)

1		2		3	(feeds)	4	(feeds)	5		6	
7	(Various)*	8		9	APTN	10		11		12	
13		14		15		16		17	Radio	18	
19		20		21		22		23	(feeds)	24	(feeds) (Various)*

### \* Programming details for Transponders with "(Various)" broadcasters

TP 7: Ambassador 1, Focus on the Family Radio Network 1, Focus on the Family Radio Network 2, IRN USA 2, IRN USA 3, IRN USA 4, Relevant Radio, Salem Radio Network 1, Salem Radio Network 2, Salem Radio Network 3, Salem Radio Network 5, Salem Radio Network A, Salem Radio Network B, Salem Radio Network C

TP 24: Folk TV, ICTV (USA)

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019. TP17 is edited based on TVROSat as of 5/9/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: SES 1

Assessment Date	5/1/2019
Satellite	SES 1
Orbital Location	101 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	SES	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jun 2010	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	19	Transponders w/ at least 1 US Customer	9
Expected Life	15.0 yrs				
Est. End of Life Date	Jun 2025				
Years Left (2)	6.1 yrs	Transponder Utilization	79%	Transponder Utilization	90%

## Transponder Detail (Customer Information)

1 (Various)*	2 (Various)*	3 (Various)*	4 (Various)*	5	6 Globecast
7 Viacom Media Networks...	8 NBC Universal	9 NBC Universal	10 OlympuSat	11 Viacom Media Networks...	12 Viacom Media Networks...
13	14 Scripps Networks	15	16 Gulfcom	17	18 OlympuSat
19 (Various)*	20 Viacom Media Networks...	21 (Various)*	22 Jewelry TV	23	24 (Various)*

### \* Programming details for Transponders with "(Various)" broadcasters

TP 1: GEB, Heroes & Icons West, Me TV, Start TV East, Start TV West

TP 2: Fashion One 4K, Insight UHD, NatureVision TV, The Country Network

TP 3: Decades, Heroes & Icons East, Movies!, SuperTalk Mississippi

TP 4: #C4K360, 4K Universe, FunBox UHD, Travelxp 4K North America

TP 19: BET Canada, BET Caribbean, BET East, BET Gospel, BET Her Caribbean, BET Hip-Hop, BET Jams, BET Soul, BET West, CMT Music, MTV Classic East, MTV Classic West, MTV Tr3s East, MTV Tr3s West

TP 21: NASA TV UHD, SES promo, UHD 1

TP 24: Canal Sur (USA), CincoMas, CubaMax TV, Estudio 5, Faith USA, Folk TV, God TV US, Living Faith TV, Primo TV, Sur Perú, TV Venezuela, V me, V me Kids, Venevisión, Zee News

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: SES 3

Assessment Date	5/1/2019
Satellite	SES 3
Orbital Location	103 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	SES	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jul 2011	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	19	Transponders w/ at least 1 US Customer	7
Expected Life	15.0 yrs				
Est. End of Life Date	Jul 2026				
Years Left (2)	7.2 yrs	Transponder Utilization	79%	Transponder Utilization	70%

## Transponder Detail (Customer Information)

1	QVC	2		3	Univisión	4	MSG	5	Globecast	6	
7	ION Media Networks	8	In Demand	9		10	(Various)*	11	(Various)* America's Auction Cha...	12	Cleo TV GMA Network
13	In Demand	14	Ovation (USA) QVC 2 TV Montana	15	HSN	16	Televisa Networks	17	ION TV	18	
19	Scripps Networks	20		21	(Various)*	22	(Various)*	23	Showtime HD Plex 3	24	Showtime HD Plex 3

### \* Programming details for Transponders with "(Various)" broadcasters

TP 10: Aspire TV, Free Speech TV, Game Show Network East, Game Show Network West, Impact TV Network (USA), PixL, TV One (USA), Up TV

TP 11: CTN (USA), CTN Lifestyle

TP 21: Bounce, Escape, GetTV, Grit, Justice Network, Laff, UniMás Este, UniMás Mountain, UniMás Oeste

TP 22: Ant1 Satellite, DW English, Easy 97.2, PX Sports, Rai Italia America, Rai News 24, Rai Radio 1, Rai Radio 2, Rai Radio 3, Rai World Premium, Rythmos 949, Spor FM, Vozrozhdeniye

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019



# Satellite Profile: SES 11

Assessment Date	5/1/2019
Satellite	SES 11
Orbital Location	104.95 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	SES	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Nov 2017	Serving C-Band			
Administration	Gibraltar   U.S.A.				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	20	Transponders w/ at least 1 US Customer	9
Expected Life	15.0 yrs				
Est. End of Life Date	Nov 2032				
Years Left (2)	13.6 yrs	Transponder Utilization	83%	Transponder Utilization	90%

## Transponder Detail (Customer Information)

1	Telex Radio	2	HITS Quantum	3		4	NBC	5	HITS Quantum	6	HITS Quantum
7	HITS Quantum	8	HITS Quantum	9	HITS Quantum	10	Viacom Media Networks...	11	Discovery Networks Radio	12	Telemundo
13	HITS Quantum	14	HITS Quantum	15	HITS Quantum	16	HITS Quantum	17		18	The Weather Channel
19	HITS Quantum	20	Viacom Media Networks...	21	Radio	22		23	HITS Quantum	24	

## \* Programming details for Transponders with "(Various)" broadcasters

N/A

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019. TP1,11,21 edited based on TVROSat as of 5/9/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: AMC 11

Assessment Date	5/1/2019
Satellite	AMC 11
Orbital Location	131 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	SES	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Nov 2004	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	16	Transponders w/ at least 1 US Customer	7
Expected Life	15.0 yrs				
Est. End of Life Date	Nov 2019				
Years Left (1)	0.5 yrs	Transponder Utilization	67%	Transponder Utilization	70%

## Transponder Detail (Customer Information)

1		2		3	In Demand	4	A&E Networks	5	Hallmark	6	
7	C-SPAN	8	GCI	9	Scripps Networks	10	NESN	11	QVC	12	(Various)*
13		14		15	Viacom Media Networks...	16	Discovery Networks	17		18	Viacom Media Networks...
19	Showtime East Plex	20	Showtime HD West Plex...	21		22	Discovery Networks	23	Univisión	24	

### \* Programming details for Transponders with "(Various)" broadcasters

TP 12: Crime + Investigation Network USA, History en Español, Lifetime Real Women, Military History US

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: AMC 8

Assessment Date	5/1/2019
Satellite	AMC 8
Orbital Location	139 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	SES	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Mar 2001	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	1	Transponders w/ at least 1 US Customer	0
Expected Life	15.0 yrs				
Est. End of Life Date	Mar 2016				
Years Left (1)	End of Life	Transponder Utilization	4%	Transponder Utilization	0%

## Transponder Detail (Customer Information)

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18 Alaska mux
19	20	21	22	23	24

\* Programming details for Transponders with "(Various)" broadcasters

N/A

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

## SECTION F

### Large Satellite Operator Utilization Summary: Eutelsat

# Transponder Usage: Eutelsat <sup>(1)</sup>

Orbital Slot	Company	Satellite	Occupied	Empty	Utilization	TP 1 TP 2	TP 3 TP 4	TP 5 TP 6	TP 7 TP 8	TP 9 TP 10	TP 11 TP 12	TP 13 TP 14	TP 15 TP 16	TP 17 TP 18	TP 19 TP 20	TP 21 TP 22	TP 23 TP 24
113 W	Eutelsat	Eutelsat 113 West A	17	7	71%	C	C	C	C	C			C	C	C		
						C	C	C	C	C	C		C			C	C
115 W	Eutelsat	Eutelsat 115 West B	1	23	4%						C						
117 W	Eutelsat	Eutelsat 117 West A	21	3	88%	C	C	C	C	C	C	C	C	C		C	
						C		C	C	C	C	C	C	C	C	C	C
172 E	Eutelsat	Eutelsat 172B	3	21	13%							C					
									C			C					
<b>Total</b>			<b>42</b>	<b>54</b>	<b>44%</b>												
<b>Avg Per Satellite</b>			<b>10.5</b>	<b>13.5</b>													
<b>Total (including backup transponder) (2)</b>			<b>46</b>	<b>50</b>	<b>48%</b>												
<b>Avg Per Satellite</b>			<b>11.5</b>	<b>12.5</b>													

	Customer Occupied
	Not Used

Source Data: Chart developed by from publicly available data from LyngSat as of 4/28/19

(1) While many, if not most, transponder content does not appear to cater to an US audience, credit is given as serving US customers based on Ex Parte Filing from 4/9/19

(2) To account for backup and occasional use, assumed each satellite assigns one transponder as spare. With 4 satellites in this analysis, this adds 4 satellites to the total occupied transponders

# Satellite Profile: Eutelsat 113 West A

Assessment Date	5/1/2019
Satellite	Eutelsat 113 West A
Orbital Location	113 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Eutelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	May 2006	Serving C-Band			
Administration	Mexico				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	17	Transponders w/ at least 1 US Customer	10
Expected Life	15.0 yrs				
Est. End of Life Date	May 2021				
Years Left (2)	2.1 yrs	Transponder Utilization	71%	Transponder Utilization	100%

## Transponder Detail (Customer Information)

1 (Various)*	2 (feeds)	3 (Various)*	4 (Various)*	5 (Various)*	6 Canal 6 Media TV Canal Catorce Hidalgo TV
7 (Various)*	8 (Various)*	9 PCTV	10 Hi-TV	11	12 Excelsior TV
13	14	15 (Various)*	16 (Various)* Claro TV promo	17 Luken	18
19 (CEPROPIE feeds) Hope Channel Inter-Am... TV Más	20	21	22 Thema America	23	24 The Erotic Networks

### \* Programming details for Transponders with "(Various)" broadcasters

TP 1: El Financiero Bloomberg, TeleFórmula, TRC TV, TV Tabasqueña

TP 3: Green TV (Mexico), Megacanal, Telemar, Telesur (Mexico), TV Cuatro 4.1, Video Rola

TP 4: Ke buena, Los 40 Principales México, México Travel Channel, RCG TV 1, Sistema Michoacano de TV, Tele 10 (Mexico), TeleFórmula, Trecevisión, Veracidad Channel, W Radio

TP 5: AMC México, Beat Box, Cine Mexicano (Mexico), Elgourmet, Film & Arts México, Hola! TV América Latina, Más Chic Lationamérica, Mega Sports, NBA TV Latin America, NFL Network, Pánico, Pasiones Estados Unidos, Platino, Platino 2, Sundance TV Latin America, TVC Deportes 2

TP 7: Conoce México, Mayavisión, Multimedios TV

TP 8: C7 Jalisco, Imagen Informativa, Imagen TV, Tlaxcala TV, TV Nuevo León 28, World TV (Mexico)

TP 15: Milenio TV, Multimedios Costa Rica, Multimedios Plus, TLR

TP 16: Ke buena, Los 40 Principales México, W Deportes, W Radio

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Eutelsat 115 West B

Assessment Date	5/1/2019
Satellite	Eutelsat 115 West B
Orbital Location	114.9 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Eutelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Mar 2015	Serving C-Band			
Administration	Mexico				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	1	Transponders w/ at least 1 US Customer	0
Expected Life	15.0 yrs				
Est. End of Life Date	Mar 2030				
Years Left (2)	10.8 yrs	Transponder Utilization	4%	Transponder Utilization	0%

## Transponder Detail (Customer Information)

1		2		3		4		5		6	
7		8		9		10		11	(Various)*	12	
13		14		15		16		17		18	
19		20		21		22		23		24	

### \* Programming details for Transponders with "(Various)" broadcasters

TP 11: Canal Once, Once niños

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Eutelsat 117 West A

Assessment Date	5/1/2019
Satellite	Eutelsat 117 West A
Orbital Location	116.8 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Eutelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Mar 2013	Serving C-Band			
Administration	Mexico				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	21	Transponders w/ at least 1 US Customer	9
Expected Life	15.0 yrs				
Est. End of Life Date	Mar 2028				
Years Left (2)	8.9 yrs	Transponder Utilization	88%	Transponder Utilization	90%

## Transponder Detail (Customer Information)

1	Edusat	2	Televisa Networks	3	Gama TV Inti Network Radio Centro	4		5	(Various)*	6	Televisa Networks
7	(Various)*	8	Azteca Guatemala UCSG TV	9	(Various)*	10	(Various)*	11	(Various)*	12	Televisa Networks
13	(Various)*	14	Honduras mux Monte María TV	15	Dominican Republic mux Ecuador TV NTR Canal 44	16	Nuestra Vision	17	CB TV Michoacan Dominican Republic mux TV Méxiquense	18	(Various)*
19		20	(Various)*	21	Lorac	22	Ecuador TV Ecuavisa Quito Oromar TV	23		24	Azteca Honduras Edusat RTV

### \* Programming details for Transponders with "(Various)" broadcasters

TP 5: (feeds), Congreso TV, Telecentro (Dominican Republic), TPSD

TP 7: (feeds), AMC México, Cine Mexicano (Mexico), Elgourmet, Film & Arts México, Hola! TV Estados Unidos, Más Chic Lationamérica, Mega Sports, NFL Network, Pánico, Pasiones Latinoamérica, Platino, Platino 2, Sundance TV Latin America, TVC, TVC Deportes 2, Video Rola

TP 9: Canela TV, PX Sports, Telefuturo (Dominican Republic), Telerama (Ecuador)

TP 10: [RTC test card], Canal Antigua, CorTV, EDN TV, IPN, Teleceiba, TV Manabita, UNAH UTV, Vea Canal

TP 11: Dominican Republic mux, Globo TV, La Voz de María, Mas TV Canal 54, MW Network, Teleuniverso (Dominican Republic)

TP 13: CB TV México, Ecuavisa, Honduras mux, NTV (Guatemala), RTG

TP 18: Cemesatel (Wed 10.30-13.30), México Gobierno Federal, Panamericana TV

TP 20: Guatevisión, México Travel Channel, Tele Ciudadana, Telesur (Mexico), TV Arquidiocesana

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019



# Satellite Profile: Eutelsat 172 B

Assessment Date	5/1/2019
Satellite	Eutelsat 172B
Orbital Location	172 E.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Eutelsat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Dec 2017	Serving C-Band			
Administration	U.S.A.				
Authorization Type	License	Transponders w/ at least 1 US Customer	3	Transponders w/ at least 1 US Customer	1
Expected Life	15.0 yrs				
Est. End of Life Date	Dec 2032				
Years Left (2)	13.6 yrs	Transponder Utilization	13%	Transponder Utilization	10%

## Transponder Detail (Customer Information)

1		2		3		4		5		6	
7		8	Hope Channel Internat... Walesi TV	9		10		11		12	
13	PNG TV Sydney Teleport Servi...	14	NBC TV	15		16		17		18	
19		20		21		22		23		24	

\* Programming details for Transponders with "(Various)" broadcasters

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

## SECTION G

### Large Satellite Operator Utilization Summary: Telesat

# Transponder Usage: Telesat <sup>(1)</sup>

Orbital Slot	Company	Satellite	Occupied	Empty	Utilization	TP 1 TP 2	TP 3 TP 4	TP 5 TP 6	TP 7 TP 8	TP 9 TP 10	TP 11 TP 12	TP 13 TP 14	TP 15 TP 16	TP 17 TP 18	TP 19 TP 20	TP 21 TP 22	TP 23 TP 24
107.3 W	Telesat	Anik F1R	8	16	33%							C					
							C	C	C		C		C	C	C		
111.1 W	Telesat	Anik F2	8	16	33%						C						
						C		C		C		C	C	C	C		
118.7 W	Telesat	Anik F3	1	23	4%						C						
<b>Total</b>			<b>17</b>	<b>55</b>	<b>24%</b>												
<b>Avg Per Satellite</b>			<b>5.7</b>	<b>18.3</b>													
<b>Total (including backup transponder) (2)</b>			<b>20</b>	<b>52</b>	<b>28%</b>												
<b>Avg Per Satellite</b>			<b>6.7</b>	<b>17.3</b>													

	Customer Occupied
	Not Used

Source Data: Chart developed from publicly available data from LyngSat as of 4/28/19

(1) While many, if not most, transponder content does not appear to cater to an US audience, credit is given as serving US customers based on Ex Parte Filing from 4/11/19

(2) To account for backup and occasional use, assumed each satellite assigns one transponder as spare. With 3 satellites in this analysis, this adds 3 satellites to the total occupied transponders

# Satellite Profile: Anik F1R

Assessment Date	5/1/2019
Satellite	Anik F1R
Orbital Location	107.3 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Telesat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Aug 2005	Serving C-Band			
Administration	Canada				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	8	Transponders w/ at least 1 US Customer	3
Expected Life	15.0 yrs				
Est. End of Life Date	Aug 2020				
Years Left (2)	1.3 yrs	Transponder Utilization	33%	Transponder Utilization	30%

## Transponder Detail (Customer Information)

1		2		3		4	AMC Canada	5		6	House of Assembly New... Legislative Assembly ... Legislative Assembly ...
7		8	(Various)*	9		10		11		12	(APTN feeds) (Various)*
13	Ici Radio Canada Télé...	14		15		16	CTV	17		18	(Various)*
19		20	(Various)*	21		22		23		24	

### \* Programming details for Transponders with "(Various)" broadcasters

TP 8: TV 5 Québec Canada Est, TV 5 Québec Canada Ouest, Unis TV Est, Unis TV Ouest

TP 12: APTN E, APTN N, APTN W, Legislative Assembly of Ontario, Rewind

TP 18: (feeds), 107.3 Rouge, Canal M (Canada), Énergie 94.3, MétéoMédia, Radio France Internationale

TP 20: (feeds), Fight Network, MétéoMédia, The Weather Network

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Anik F2

Assessment Date	5/1/2019
Satellite	Anik F2
Orbital Location	111.1 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Telesat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Jul 2004	Serving C-Band			
Administration	Canada				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	8	Transponders w/ at least 1 US Customer	3
Expected Life	15.0 yrs				
Est. End of Life Date	Jul 2019				
Years Left (2)	0.2 yrs	Transponder Utilization	33%	Transponder Utilization	30%

## Transponder Detail (Customer Information)

1		2	VSEN Henrico (08.45-...	3		4		5		6	VSEN Varina (08.45-1...
7		8		9		10	(feeds)	11	(feeds)	12	
13		14	VSEN Wise (08.30-13...	15		16	(feeds)	17		18	(feeds)
19		20	Saskatchewan mux	21		22		23		24	

\* Programming details for Transponders with "(Various)" broadcasters

N/A

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

# Satellite Profile: Anik F3

Assessment Date	5/1/2019
Satellite	Anik F3
Orbital Location	118.7 W.L.

## Satellite Info (1)

Satellite General Info		Transponders Serving 3.7 - 4.2 GHz		Transponder Serving 3.7 - 3.9 GHz	
Operator	Telesat	Total Transponders	24	Transponders Needed to Clear 200MHz	10
Date of Service	Apr 2007	Serving C-Band			
Administration	Canada				
Authorization Type	Market Access	Transponders w/ at least 1 US Customer	1	Transponders w/ at least 1 US Customer	0
Expected Life	15.0 yrs				
Est. End of Life Date	Apr 2022				
Years Left (2)	2.9 yrs	Transponder Utilization	4%	Transponder Utilization	0%

## Transponder Detail (Customer Information)

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24

\* Programming details for Transponders with "(Various)" broadcasters

N/A

(1) Satellite Info from FCC Space Station List downloaded on 4/24/2019. Transponder information from LyngSat downloaded on 4/28/2019

(2) Years left as of Assessment Date of 5/1/2019

## SECTION H

### Reimbursement Estimates

# C-Band Alliance Customer Reimbursement Proposal

No. of Earth Station Antennas (1)

18,223

	Cost per Antenna	Base Case			Maximum Possible		
		% of Antennas	No. of Antennas	Total Cost (\$mil)	% of Antennas	No. of Antennas	Total Cost (\$mil)
1. Filter Implementation							
Dual-Feed	\$800	40%	7,289	\$5.8	100%	18,223	\$14.6
Single-Feed	\$600	60%	10,934	\$6.6	0%	0	\$0.0
				\$12.4			\$14.6
2. Transponder Migration Action Types							
Frequency Change	\$100	100%	18,223	\$1.8	100%	18,223	\$1.8
Polarization Change	\$200	50%	9,112	\$1.8	100%	18,223	\$3.6
Satellite Change	\$400	33%	6,014	\$2.4	100%	18,223	\$7.3
Antenna Replacements	\$3,700	20%	3,645	\$13.5	100%	18,223	\$67.4
				\$19.5			\$80.2
				Total Cost			
				\$31.9			
							Total Cost
							\$94.8

- On 4/3/19, C-Band Alliance filed an ex parte describing the proposed compensation scheme for customers impacted by the C-Band transition.
- Two scenarios outlined above estimate the bookends of possible compensation to C-Band users and earth station operators. It must be noted the "Maximum Possible" is for illustrative purposes only, as it is impossible for every earth station to require frequency change, polarization change, satellite change and antenna replacement

(1) FCC IBFS data downloaded on 1/14/19. Antennas spread out over 13,733 registered earth station sites



## SECTION I

### Methodology and Sources

## Methodology and Sources

<u>Section</u>	<u>Methodology and Sources</u>
A	<ul style="list-style-type: none"><li>• Space Station List maintained by FCC's International Bureau used to determine list of C-Band satellites (63) that cover part/all of CONUS</li><li>• Ex parte filings made by CBA members used to determine the subset of satellites (i.e., 23 satellites) that are relevant for regrooming</li><li>• Transponder utilization determined from publicly available data (Sources: LyngSat and TVROSat)</li></ul>
B	<ul style="list-style-type: none"><li>• Assessed enterprise value associated with US C-Band revenue</li><li>• Compared against data from recent mid-band auctions held across the world</li></ul>
C	<ul style="list-style-type: none"><li>• Generated satellite use and transponder profiles for each satellite</li><li>• Calculated utilization based on the customer presence on each transponder (Sources: LyngSat and TVROSat)</li></ul>

# Methodology and Sources

<u>Section</u>	<u>Methodology and Sources</u>
D-G	<ul style="list-style-type: none"> <li>Downloaded data from LyngSat, with a focus on the 23 key satellites. Data for this presentation downloaded on 4/28/2019.</li> <li>In data fields where "Provider Name" has an entity listed, the respective transponders are colored orange as "Customer Occupied."</li> <li>It is assumed that if the data field "Provider Name" is empty but the "System Encryption," "DR-FEC", and "Channel Names" fields are populated, then the "Provider Name" will be standardized to "(Various)" where there are individual channels that do not group into a larger entity. In the Transponder Usage Chart, these transponders are colored orange as "Customer Occupied."</li> <li>It is assumed that if the data fields "Provider Name," "System Encryption," and "SR-FEC" are empty, then the transponder is not being used. In the Transponder Usage Chart, these transponders are colored green as "Not Used."</li> <li>Even if a transponder is partially utilized, as long as there is even one signal, the transponder is credited as utilized in the analysis.</li> </ul>
H	<ul style="list-style-type: none"> <li>Calculated reimbursement proceeds based on earth station count in IBFS and CBA's Customer Commitment Ex Parte (4/3/19)</li> </ul>

## SECTION J

### Addendum Author Profiles

## Addendum Author Profiles

**Nelson Chan** has over 10 years of experience in finance, valuation, analysis, forecasting and business operations. Mr. Chan has been in the telecommunications industry for over 8 years, most recently serving as VP of Finance at LocusPoint Networks, where he was extensively involved in managing the portfolio of investments in TV broadcasting assets from acquisition to sale in the broadcast incentive auction. In managing the portfolio, he worked closely with the company's data analytics team to evaluate potential values associated with all TV stations in the US and devise appropriate strategies used in the incentive auction to maximize the value of the portfolio. Previously, Mr. Chan worked at Fibertower, where he was involved in finance and strategy. He started his career at RBC Capital Markets working in the M&A group executing transactions across technology, healthcare and energy industries, as well as produced numerous valuation and fairness opinions. Mr. Chan received his BS in Business Administration from UC Berkeley's Haas School of Business and a BA in Economics also from UC Berkeley.

**Brian Kui** has 17 years of experience in data analysis and financial consulting. Currently, Mr. Kui serves as Manager of Decision Support for Community Memorial Health System, a non-profit with multiple hospitals and clinics, where data-driven decisions are made with his analysis. Previously, he was the Manager of Data Analytics for LocusPoint Networks, where he worked on auction simulations and analysis for the FCC 600 MHz spectrum auction. Before this, Mr. Kui spent the majority of his professional career at Hemming Morse, a consulting and CPA firm, where he provided a broad range of consulting services to diverse industries. He received his MS in Data Science from the University of San Francisco and BS in Cognitive Science / BA in Economics from UCLA. He also holds an active California CPA license.